
United States
Circuit Court of Appeals 5
For the Ninth Circuit

Transcript of Record

GEORGE J. HENRY, Jr.,
Complainant.

vs.

CITY OF LOS ANGELES,
Defendant.

VOLUME 2
(Pages 401 to 800 Inclusive)

Upon Appeal from the United States District Court for
the Southern District of California,
Southern Division

FILED
JAN 4 - 1918
F. D. MURKIN
CLERK

A. They do.

Q. 424. And as to Complainant's Exhibit Z, please point out again what difference, if any, exists between the same and Complainant's Exhibit ZZ.

A. The differences that exist between Exhibit ZZ and Z are that the Exhibit ZZ illustrates the addition of "means actuated by said controller on movement thereof from normal position to engage said clutch with said shaft so as to cause the return of the controller to normal position and interrupt the governor action before it has overrun the proper amount" and "actuating means controlled by said controlling means to return the controller to inoperative position so as to prevent excessive movement of the governor."

Q. 425. Now, as to what you believe was new with Lyndon's, as reflected and evidenced by the disclosure in the patent in suit, without further defining this, please state whether such novelty attached to the separate detailed parts, such as magnets and solenoids, per se, or to the general combination and inter-relation and inter-operation of parts, or both.

A. I consider that it is broadly a combination, inter-relation and actuation of several parts and also in addition thereto the use of a specially wound electro-magnetic means sensitive to speed variations, in which the voltage varies to a greater degree than the speed, as a separate and distinct invention.

Q. 426. Now, will you please state whether or not the parts controlled under the action of solenoid 33 and of the core thereof and the parts connected therewith, together with the features controlled by the circuits made

through the contacts 40 and 41, and together with the feaures controlled through the circuits made at the contacts 45 and 46, permit of the operation of the governor apparatus of the Lyndon patent in suit so that the water gate may be operated independently of the by-pass and by-pass valve.

A. Yes, sir; it may be. Referring to blue prints Exhibits AA, BB, CC and DD, this manner of making two or more sets of contacts is clearly set forth.

Q. 427. Now, in claims 1 to 5 inclusive of the Lyndon patent in suit, I do not find any reference to a by-pass or by-pass valve. From your understanding of the disclosure of the Lyndon patent do you or do you not consider that these claims relate to a separate branch or part of the Lyndon patent in suit as contemplating, for instance, operation of the governor and of the water gate irrespective of the by-pass, as testified in your last previous answer?

A. I do.

Q. 428. Then do you or do you not make it out that the patent contemplates in both specification and claims, both by-pass operation jointly with water gate operation and water gate operation independently of by-pass operation?

Mr. Westall: Objected to as leading.

A. Yes, sir; I do.

Q. 429. By Mr. Blakeslee: Within your conception of the invention, I wish to have it clearly understood on the record, as to whether or not you consider that portion of the invention set forth in Claim 6 of the Lyndon patent to call for operation of the by-pass valve inversely

to the operation of the water gate when the water gate moves in either direction.

A. No.

Q. 430. Within your conception of the invention, I wish to have it clearly understood on the record as to whether or not you consider that portion of the invention set forth in Claim 6 of the Lyndon patent to call for operation of the by-pass valve inversely to the operation of the water gate when the water gate moves in both directions.

A. No.

Q. 431. Do you in Claim 6 find anything which leads you to deduce that a structure embodying the language of Claim 6 aims to embody the invention, and to set up the operation of the invention moved in both directions and of the by-pass moving with it in both directions inversely.

A. I do not.

Q. 432. When you witnessed the operation of the Cottonwood plant on January 2, 1914, how did its operation compare with the operation of the several parts and features as testified to by you in this deposition?

A. Exactly as I have testified to.

Q. 433. And did you or did you not note this operation carefully as to all features of the inter-related moving parts causing the governor action?

A. I did.

Q. 434. Now, as to the operation of the governors, including the Lombard device as disclosed in Complainant's Exhibit W, was such operation the same as the operation of other examples of the same types of governors in accordance with the standard practice?

A. Yes, sir.

Q. 435. Is the operation of the governors in both the Cottonwood plant and the Division Creek plant No. 2 testified to by you, such that anyone skilled in the art can trace the movements and actions and effects of the working parts?

A. Yes, sir; by close attention and study of the devices they will become quite apparent to one skilled in the art.

Q. 436. And is such operation and action of these parts so plain to one skilled in the art that upon inspecting the same he can determine the operative effects without disjoining or separating or opening up any of the parts and devices?

A. I should say if he was very familiar with the art such would be the case. If he was merely familiar with companion arts it would not be so apparent.

Q. 437. Now, is it, or is not a fact that Claims 6 to 9, and especially claims 7 to 9 inclusive, of the Lyndon patent include or call for particular parts and combinations of parts other and further than those recited in question 66 commencing on page 30 of the record?

A. Yes, sir.

Q. 438. And the invention disclosed by the Lyndon patent in suit relates to the various aspects of a governor and governor parts? Does it or does it not?

Mr. Westall: I object to the form of the question as leading.

A. It does.

Q. 439. By Mr. Blakeslee: Can you state with reference to the Cottonwood and Division Creek No. 2

plants what the total horse power is that they are capable of generating as an outside estimate?

Mr. Westall: Objected to as not proper redirect examination, incompetent, irrelevant and immaterial.

A. I should expect each unit in the Cottonwood plant to be capable of developing not less than 1350 horse power and possibly as high as 1500. I should expect the unit at Division Creek No. 2 plant to be capable of developing not less than 1050 and possibly as high as 1200 horse power.

Mr. Blakeslee: You may re-cross.

RECROSS EXAMINATION.

By Mr. Westall:

Q. 440. Where in the patent in suit is there any suggestion that the water gate may be operated separate from the by-pass valve?

A. In Claims 1, 2, 3, 4 and 5 which are applicable to any form of gate-operative means, which might or might not be provided with a by-pass. For example, the deflecting nozzle form as illustrated in unit No. 1 on the Cottonwood plant is so operated.

Q. 441. Would you consider that deflecting nozzle type an infringement of the claims you have mentioned?

Mr. Blakeslee: Objected to as indefinite and incomplete, irrelevant, immaterial and incompetent.

A. I would want to give very exhaustive consideration to that question before answering it.

Q. 442. By Mr. Westall: I call your attention to the language of the specification on page 4 at line 40, where it is said: "When the governor acts to close the

main gate, the compensating device will open more widely the by-pass." And at line 48 where it is said: "Should the main gate open, a reverse action takes place," and I ask you to state whether or not in your opinion those two quotations do not show that Lyndon contemplated that there should be a corresponding inverse motion of the water gate and by-pass valve at all times when the water gate was opened or closed?

A. No, sir.

Q. 443. Can you explain more fully the reason for your last answer?

A. When the water gate is opened or closed no movement is taking place in the by-pass valve.

Q. 444. Is that not a direct contradiction to the language quoted, "when the governor acts to close the main gate, the compensating device will open more widely the by-pass"?

A. No, sir. I understood your question to be when the gate was open or closed. The language which you have just quoted indicates during a period of movement of the gate. By referring to that portion of the specifications commencing on line 40 of page 4, reading, "When the governor acts to close the main gate, the compensating device will open more widely the by-pass," this language indicates very clearly that it is during governor movement and states that "the compensating device will open more widely the by-pass."

Q. 445. With reference to the language at line 48 "should the main gate open, a reverse action takes place"?

A. That very clearly means that should the governor during its movement of the main gates in an opening

direction occur, a reverse action takes place. But it does not follow that the by-pass valve necessarily moves in a closing direction, because a reverse action does not necessarily mean an action exclusively of the by-pass valve, but an action of other parts which connect with the by-pass valve. The by-pass valve might easily be on its seat and still the language apply with perfect propriety—"should the main gate open, a reverse action takes place." "Reverse action" being action of the connecting part. If the by-pass valve had been in an open position, such reverse action would permit its moving toward a closed direction. But such open position of the by-pass at the commencement of the reverse action does not appear to me to be essential.

Q. 446. Is it not a fact that Lyndon shows a device that, taking it in connection with the language above quoted at lines 40 and 48 on page 4 of the patent, makes it clear that he contemplates a movement of the by-pass valve whenever the water gate is opened or closed in the action of the governor?

Mr. Blakeslee: The witness has already testified to this distinctly in his redirect examination, and I may say particularly in discussing the import and meaning of Claim 6 of the patent in suit.

A. It is clear that Mr. Lyndon contemplates a device in which the by-pass is moved in an inverse direction to the main gate when, in some cases, the water gate is moved in one direction, and in other cases where it is moved in the opposite direction. Had Mr. Lyndon intended to have made it necessary for the by-pass to move in both directions inversely to every governor

movement, he would have worded his claims very differently. I distinguish very clearly between the words "either" and "both."

Q. 447. By Mr. Westall: You have testified on re-direct examination that Claims 6 to 9 disclose parts and combinations of parts other than those described in question 66, commencing on page 30 of the record. Briefly mention, without any explanatory exposition, what those parts consist of.

A. The various elements mentioned in the claims which you have just mentioned and which form no part of question 66.

Q. 448. Taking up the claims just mentioned, state specifically each element, if you will.

Mr. Blakeslee: We object to this as being mere repetition and as calling for something which appears from the record. The claims speak for themselves. The claims and the elements are capable of ready comparison with the language under discussion; and we submit that it is an unnecessary incumbering of the record to go on with this procedure.

Mr. Westall: Counsel for the defendant would inquire why the question was put on redirect examination if it was not pertinent and vital to the issues of the case.

Mr. Blakeslee: In response I will say that when a question is once put and answered it loses that vitality which is necessary to support a further question directed to the same inquiry. And the last question is further objected to as not exactly quoting the question in re-direct examination referred to by counsel.

A. The several parts which are not specifically men-

tioned in question 66 to which you have directed my attention, are such as the clutch, the returning device, the water-gate-operating shaft, the controller, the driving shaft, the dynamo and such other parts. While these parts to some degree are included in the governor in the said question, some of them are not.

Q. 449. By Mr. Westall: I understood you to say on redirect examination that construed broadly the combination, inter-relation and operation and actuation of the several parts, and probably with regard to the use of the specially wound electro-magnet means, in which the voltage variations are greater than in direct proportion to the speed, rather than the specific means and arrangement of parts as disclosed in the Lyndon patent to constitute what you conceive to be the essence of the Lyndon invention. Is that correct?

Mr. Blakeslee: Objected to in such parts thereof as are not in accordance with the previous testimony of the witness.

A. No, sir. I consider that as regards the dynamo responsive to speed, that possibly there was patentable novelty in this feature also, and meant my answer to Mr. Blakeslee's question to so indicate.

Q. 450. By Mr. Westall: You considered those, did you not, the electro-magnetic means, including the specially wound dynamo, as features of novelty, did you not?

A. I believe that it is a feature of novelty in the Lyndon patent as used for governor control. It was a well known device in the electrical art, and I am very certain and know of dynamos having been so wound at

an earlier date, but not put to this new and useful purpose for controlling a governor.

Q. 451. But you do not wish to be understood as testifying that such novel feature is contained in the alleged infringing devices, do you?

Mr. Blakeslee: Objected to as indefinite.

A. No, sir; I do not allege that any such dynamo features, responsive to speed, for the purpose of operating the governor is in existence in the alleged infringing devices.

Q. 452. By Mr. Westall: You conceive the inverse action of the by-pass valve and the water gate, do you not, to be a novel feature or a novel result attained by the means disclosed by the Lyndon patent?

Mr. Blakeslee: Objected to as not proper cross-examination.

A. I consider it a novel means and combination for any governor or governing means. I believe it to have been new with Lyndon at the time of the Lyndon invention.

REDIRECT EXAMINATION.

By Mr. Blakeslee:

Q. 453. Does the Lyndon patent or does it not teach that the by-pass operates always in all governor actions affecting the water gate?

A. It does not teach that at all times it acts in connection with movements of the water gate. But it very specifically teaches the necessity for its action where inertia effects in the water column would otherwise affect the accuracy and efficiency of the water wheel governing, and, as such, is inherently new.

insert }

410 31 insert "By consent of counsel on both sides an adjournment is now taken until Monday morning, January 26, at 8 o'clock, and the witness is excused subject to appearance at that hour for further direct examination as per previous notice and reservation. Geo. J. Henry, Jr., complainant, appearing as a witness further on his own behalf, and pursuant to the notice given by counsel for the complainant herein, testified as follows:"

DIRECT EXAMINATION (resumed).

January 26, 1914. A. M. *By Mr. Blakely*

Q. 454. Have you prepared the further matter illustrative of either or both of the power-generating plants known as the Cottonwood or Division plant No. 2, testified about in your previous testimony, in accordance with my previous request on the record?

A. I have prepared such a drawing of apparatus of the No. 2 unit at the Cottonwood plant, and that portion of the governing apparatus above the floor line corresponds with the apparatus of the No. 1 unit of the Cottonwood plant, which I now hand you; and I am preparing a corresponding drawing of the Division Creek No. 2 plant apparatus.

Q. 455. Please state what method you have followed in the preparation of this drawing or blue print, as it appears to be.

A. I have taken one of the printed copies of the Lyndon patent in suit and cut into segments the Figure 1 of the drawings thereof and pasted these several parts in positions adjacent to the corresponding parts or mechanical equivalents of the apparatus shown, and as existing at the Cottonwood plant. I have also cut in to several elements and groups of elements Claims 3, 4, 6, 7 and 8, and pasted such elements or groups of elements approximately adjacent to the corresponding parts and mechanical equivalents of the drawing in question. I have adopted a means of lettering and numbering these elements and groups of elements as follows: The elements and groups of elements should be read consecutively by following the letters of the alphabet

consecutively for each claim as indicated by the number following such letter. The nomenclature is as follows: For Claim 3, A-3, B-3, C-3, D-3, E-3. For Claim 4, A-4, B-4, C-4, D-4. For Claim 6, F-6, G-6, H-6. Claim 7, F-7, G-7, H-7, I-7. For Claim 8, F-8, G-8, H-8, I-8, J-8, K-8, L-8.

Q. 456. And by means of this system of nomenclature and identification, are the elements of each claim, the number of which you have given in your last answer and located upon the blue print in juxtaposition with the elements or groups of elements of the alleged infringing structure, and the corresponding elements or groups of elements of the Lyndon patent in suit in accordance with the comparison you have made, in general conformity with the comparison you have made in your previous testimony?

A. Yes, sir; as closely as could be done without covering up structural essentials of the drawing.

Q. 457. I notice a number of fine ink lines traced over the blue print. Have these any particular significance?

A. In a few of the claims I started to draw lines from the elements or groups of elements to the next occurring elements or groups of elements as read in the claim, but I abandoned this for a red pencil designation, however, with the designation above specified.

Q. 458. I further notice that there are some portions or clippings attached to this blue print in connection with which no printed claim excerpts appear. What are we to understand as to that arrangement?

A. The drawing was susceptible of some further sub-

division than the elements and groups in the claim, and I have therefore pasted those portions of the drawing Figure 1 in some instances in slightly different locations.

Q. 459. And this, I take it, was done for the purpose of showing more happily the structural comparison of the drawing of the Lyndon patent with the construction of the said Cottonwood unit?

A. Yes, sir.

Q. 460. And these several parts of the drawings of the claims applying to this blue print, you say, was taken from the Lyndon patent in suit. I suppose they were cut from a copy of the patent?

A. From a printed copy of the patent; yes, sir.

Q. 461. And all from the same printed copy?

A. Yes, sir.

Mr. Blakeslee: We offer in evidence the blue print with its attached pasted fragments of the copy of the Lyndon patent in suit, as explained by the witness, as Complainant's Exhibit KK.

(The said blue print so offered in evidence is marked by the Examiner as Complainant's Exhibit KK.)

Q. 462. By Mr. Blakeslee: Please state further from what sources and by whom was this Exhibit KK, blue print, prepared?

A. From the exhibits in the case, Complainant's Exhibits E, F, G, X, W, U and UU, and the drawing was prepared in my draughting room immediately under my direction. I am having a similar drawing prepared of Division Creek No. 2 apparatus.

Q. 463. In connection with this Exhibit KK, I will

ask you to briefly point out the comparative operations of the means preventing the governor from overrunning.

A. The means preventing the governor overrunning consists in the alleged infringing apparatus of a dashpot and associated parts shown close to the fly balls in the upper portion of the governor apparatus, and each of the rod and lever connections to the water-gate-operating shaft, to the controller, to so receive primary motion from the controller, the returning motion taking place to restore the controller to inoperative position, said returning motion being affected through the actuating rack and pinion on the vertical stem under the action of a tension spring shown connected to the fingers pressing against each end of the rack. This returning motion is at a rate under the control of the needle valve in the proportion of the said dashpot controlling the port through which passes the oil during the movement of the dashpot with respect to its piston and piston head. This controlling rate, said control being effected through primary movement of the device from the controller, returns the controller to inoperative position so as to prevent excessive movement of the governor. This apparatus is shown in more detail in Exhibit ZZ. I might state that in the drawing Exhibit KK and Exhibit ZZ the fingers and actuating spring are shown in a vertical plane so that their action may be clearly shown in a single drawing. Whereas, in Exhibit W they are in a plane at right angles thereto, the operation being identical in either case and said operation being introduced merely for the purpose of making the operation clear in the drawings KK and ZZ.

Q. 464. You have discussed a certain portion of the Lyndon invention pertinent to the means for preventing overrunning of the governor, consisting more particularly in the elaboration of those means, preventing over-movement and jamming of the water gate and over-movement and jamming of the by-pass valve, such means being respectively controlled by the circuit breaker at 84, 85, 86 and 87, and by the circuit breaker at 74 and 75. Will you please now point out what means operate to prevent such features overrunning, or jamming, in the Cottonwood plant installation as exemplified by Exhibit KK.

A. As distinguished from the overrunning device mentioned in my last answer and which limits the overrunning even on comparatively small movement of the governor, we must in the installation of governing apparatus provide means such that when the gate arrives at either end of its stroke, at its limits, in other words, some means must be provided for preventing the governor forcing excessive stress by an effort to continue movement after such limits have been reached. Such means are provided in the alleged infringing apparatus through the limits of the movement of the plunger or piston in the operating of the governor cylinder, which when properly adjusted arrives at the end of its stroke and is limited by the piston heads to prevent such damaging stress.

Q. 465. Being what part of Complainant's Exhibit ZZ?

A. This part is shown as the cylinder and cylinder heads and piston and piston heads within the cylinder.

in Exhibit ZZ, and described thereon in red pencil as “means for operating same in either direction to govern the water wheel,” and having in front of said writing the numeral 2.

Q. 466. Have you anything further which you wish to say with respect to the sequences of operation of the following elements or groups of elements disclosed in the Lyndon patent in suit, namely: First, the water-gate-operating means; second, the means for preventing over-running of the governor, and, third, the by-pass-operating means, and to the possible alteration of the order of sequence in accordance with the working conditions which may arise?

A. I might say that I have pointed out previously in my cross-examination the two new particular principles introduced into the art by the Lyndon invention. The application by Lyndon of a by-pass and a valve therein controlled by the action of the governor, said valve to be reversibly operated in combination with a water gate in either direction, is for the purpose of taking care of too decided inertia effects which take place in water supply pipe lines. The first of these and the one of most frequent and greatest importance is the prevention of water-ram or water-hammer occurring during periods of gate closure and which must be prevented during periods of quick gate movement by the opening of a by-pass. This corresponds with one of the movements described by Mr. Lyndon. The second condition arises with a long pipe line under gentle slope, where, in order to get the velocity of the water up to the requisite point in a minimum space of time, it is advantageous

to have a portion of the water velocity provided before governor movement to open the water gate takes place, and for the purpose of assisting gravity to get the water velocity up the requisite amount when the governor moves the gate in an opening direction. These two uses of the Lyndon invention are distinct and available separately and are clearly provided for in the wording of Claim 6. The other principle, that of preventing the overrunning of the governor, is entirely separate and distinct from the by-pass as used above. It is, however, an essential of almost all governors as meeting the requirement of speed regulation in hydro-electric plants today. It is to be used in combination with a governing apparatus as previously pointed out, and adjusted with especial respect to "fly wheel" capacity or inertia effects of the rotating apparatus, including the water wheel, generator and apparatus supplied by the generator. The inertia of the rotating parts of a system supplied by the water wheel are a matter of special design entirely separate and distinct and not being dependent in any way upon the inertia effects of the water in the pipe line. It is therefore obvious that in any governor plant, as compared with any other plant having different pipe lines or inertia effects of the rotating apparatus, we must be capable of adjusting our several governor elements so as to meet the requirements in each individual case. We must therefore be able to adjust our controller returning means to meet the inertia effects of the rotating apparatus. This is accomplished by an adjustment of the automatically moved valve which I have marked "may be adjusted by hand" on Exhibit ZZ, and corresponding adjustment in the Lyn-

don device may be effected by the springs 27, 28 and 29, the radius on which is set on pin 23 on the Lyndon clutch, the winding of the magnets 31 and 32, the weight of the lever arm 24, the degree of movement of the rod 43 or, most frequently, the adjustment of the contacts 45 and 46, 45A and 46A, with respect to the contact 40 and 40A, 41 and 41A. The rate of movement of the by-pass may be adjusted and its periods of engagement may be adjusted in the Lyndon device by contacts and mercury cups 100, 101, 103 and 104, and by the diameter of sheave 54 on shaft 20, or the length of the double lever 50 on by-pass valve 49. Different lengths of arms on this lever would accomplish a different rate of movement on opening or closing the dashpots. Weights 69 and 70 may also be adjusted. It will thus be seen that every adjustment is provided to meet varying requirements. There may be cases where the fly wheel element or inertia of the rotating parts is very great and where the pipe line is very short. In such cases the mercury cups 45 and 46 might well be adjusted to engage contacts 45A and 46A later than contacts 100 and 101 would engage mercury cups 103 and 104.

Q. 467. And in this connection for what purpose would you bring in the by-pass earlier than you would resultantly bring in the action of the returning device?

A. I might better say that I would delay the action of the returning device in such a case, as the stored energy of the rotating parts of the plant would make its responsiveness to speed variation slower and the governor would therefore require a slower operating device. If, on the other hand, the pipe line was quite long, the importance of the by-pass would be greater

and without changing the setting of the contacts 45A, 46A, 45 and 46 I would adjust the by-pass, for example, by putting more mercury in the cups 103 and 104 so that it would come into engagement with the contacts 100 and 101 at an earlier period and remain in engagement a longer time. If now the long pipe line were on a very gentle slope, that is, the plant operating under a comparatively small head, I would adjust the by-pass so that it would be partially open at the time the main gate was closed. This would be accomplished through the weights and dashpots 69 and 70, thus utilizing the by-pass for both directions of movement of the water gate. If, on the other hand, the pipe line were long and under a high head, so that we need not have any initial velocity of water flowing to bring it up to the requisite velocity quickly on governor movement, I would adjust the dashpot and weights 69 and 70 so that the by-pass would normally be closed or nearly closed and utilize it at the time when the water gates were moved in a closing direction by the governor to provide an adequate by-pass to relieve the pipe line from inertia effects. These various adjustments are such as would be readily made by one familiar with the apparatus and with the operation of a hydro-electric plant.

Q. 468. And how are the possibilities of such adjustment evidenced in the setting of the by-pass valve in the Cottonwood plant?

A. Such adjustment is effected in that case by the adjustment springs on the side of the dashpot, and the adjusting screws for adjusting the port ways for all passage around the piston head. The springs may be

adjusted by nuts restraining them at one end and the adjusting screws of the dashpot, as are clearly shown in photographs Exhibits E to P inclusive, and the line drawing Exhibits U and V.

Q. 469. And, again, the setting of the by-pass valve in the Cottonwood plant, as shown in said Exhibits, testified to by yourself and Mr. Scattergood, indicates what conditions in the pipe line?

A. It indicates the natural setting where the pipe line is under a high head, not requiring an initial velocity of water through the pipes.

Mr. Blakeslee: You may cross-examine.

CROSS-EXAMINATION.

By Mr. Westall:

Q. 470. Marking as you have, and in attaching to the blue print to which you have referred in your testimony, certain parts of the drawings of Figure 1 of the Lyndon patent in suit, and parts of Claims 3, 4, 6, 7 and 8, is it your intention to admit that the alleged infringing devices do not embody the mechanical equivalents of the elements and parts of elements described in Claims 1, 2, 5 and 9 of the Lyndon patent in suit?

Mr. Blakeslee: Objected to as not proper cross-examination. There has been no direct examination subject to the present cross-examination which could in any way be considered as a concession. If counsel wishes to make direct inquiry as to whether the witness wishes to make any such confession, that is a different matter.

A. No. I think the mechanical equivalents of Claims 1, 2, 5 and 9, broadly speaking, do exist as testified to by me yesterday under cross-examination.

Q. 471. By Mr. Westall: So that in the marking of the blue print referred to in the way that you have marked it, you do not wish to be understood as receding from your former testimony respecting the claims not included in the markings on that Exhibit? Is that correct?

A. I do not wish to recede from my statements under cross-examination at the last session regarding the mechanical equivalents that I have testified to as being found in the alleged infringing apparatus.

Mr. Westall: That will be all.

Mr. Blakeslee: Now, let it be noted that the present witness is excused until such time as he can produce the further blue print showing.

Mr. Westall: Before you excuse the witness, during your previous cross-examination there was a certain question reserved for your further consideration.

A. I beg your pardon. I meant to tell you about that. I might add in response to the questions which you asked me in the previous cross-examination, and for which I asked more time to give consideration, I would say that the language is partially descriptive of part of the apparatus. The same applies as an answer to the other question.

Q. 472. In what respect does it fail to be completely descriptive of the device of the patent in suit as described in Claim 6 of the Lyndon patent?

Mr. Blakeslee: The same objection and notice as made of record in connection with the putting of the question under discussion are again made.

A. I would want more time to give consideration to that question before answering.

Q. 473. By Mr. Westall: What would you add or subtract from the language quoted which, in your opinion, would make it more nearly describe the device called for in said Claim 6?

Mr. Blakeslee: The same objection.

A. I would subtract all of it and add all of Claim 6.

Q. 474. By Mr. Westall: How much further time would you need to completely answer the question?

A. If my previous answer does not completely answer your question already, and if I understand your wish that I put in other words the exact equivalent of Claim 6 which I consider a perfect description as far as the elements go of the alleged infringing devices, I might say for that purpose I would want a day or two to give consideration to such further answer.

Mr. Westall: I believe that is all.

Mr. Blakeslee: In this connection we again notify counsel that he is making the witness his own, and as time is limited for completing the making of Complainant's prima facie case, we suggest again that matters of defense be presented within the time allowed therefor.

Now, the witness is excused to return when ready to produce further blue print which he has this morning stated he is having prepared, and for such further testimony as may be required, providing the motions set for the 29th of this month are denied by the court or defendant refuses to sufficiently comply with the requests and demands and notices pertinent to such motions.

C. L. CORY, heretofore excused and instructed to return, thereupon returns and further testifies as follows upon so resuming.

DIRECT EXAMINATION (resumed).

By Mr. Blakeslee :

Q. 207. I again call your attention to the disclosures of the Lyndon patent in suit, and, particularly, to the language of Claims 3, 4, 5, 6, 7, 8 and 9, and I will ask you to state from such disclosures what you gather to be the import thereof with respect to the relations between the water gate and by-pass, with respect to the movement thereof, and I might more particularly state this in this way: you have testified that the gate moves at certain times in regulating or governing, and that the by-pass moves at certain times in regulating or governing. Please now state what your comprehension of the Lyndon patent disclosure is as to these things with relation to each other.

A. The disclosure of the patent in suit, particularly as indicated in Claims 3, 4, 5, 6, 7, 8 and 9, indicate that the motion of the water gate and the motion of the by-pass valve is controlled by a controller, which controller is responsive to changes in the speed of the water wheel, and that means are provided to return the controller to normal position and stop the governing action prior to the time that the same has overrun the proper amount, or to prevent excessive movement of the governor; that the operation of the controller which is responsive to speed is such as provides means for operating the water gate in either direction and also for operating the by-pass inversely or contrariwise to the direction in which the water gate is operated. By "direction" I mean with reference to whether the respective valves—the water gate valve and the by-pass valve—are operated toward

a closed position or to wide open position; and also that means are provided as disclosed in the patent for allowing the by-pass valve to return to normal position after governing action is completed. Means are also provided as disclosed in the patent for holding the by-pass valve normally in a partly open position if desired, and means are provided to operate the by-pass valve in either direction, and also means provided for returning the by-pass valve to normal position after the governing action is completed upon the water wheel. Or, to put it in another way, a controller is provided responsive to changes of the speed of the water wheel. The action of this controller is such as to provide means for moving the water gate in either direction to govern the water wheel; that the operation of the water gate and the valve controlling the by-pass is such that they will be respectively moved inversely, and that after the governing action is completed means are provided for returning the by-pass valve to its normal position.

Q. 208. Referring again to said enumerated claims of the Lyndon patent, 3 to 9 inclusive, I call your attention more particularly to the language of each of the same which states generally that the water gate and the water-gate-operating shaft are moved in either direction. What do you take ~~the~~ broad import of that language to be?

A. I take the import of that language to be that the water gate may be moved either so that it will increase the opening through which the water supply ^{you} to the wheel for driving the same, or the water gate, may be opened so as to decrease the size of the opening through which

the water supply for the operation of the wheel goes. That means are provided therefor for operating the water gate in either direction to govern the water wheel.

Q. 209. Now, when it comes to the operation of the by-pass valve and the operation thereof inverse to the operation of the water gate, as, for instance, set forth in Claim 6, do you take it to follow that the patent in the disclosure preserves this same distinction last made or the contrary?

A. The disclosure of the patent is such as to indicate that the operation of the governing mechanism is in accordance with the distinction last made, since in Claim 6 it is distinctly set forth that in combination with a water wheel means are provided for operating the water gate in either direction, and also means that are connected to the water gate operating means that operate the by-pass inversely to the operation of the water gate.

Q. 210. Now, supposing his Claim 6, for instance, had employed the words "both directions" in substitution for the words "either direction" which appear in line 3 of the claim. What change, if any, would you consider this change of language to make in the import of the claim and the invention as stated thereby?

A. In Claim 6 if the words "both directions" were substituted for the words "either direction" in line 3 of that claim, which is line 63 on page 5 of the patent, I would interpret that change in wording to restrict the disclosure to operating the water gate both toward the closing position and toward the opening position and the operation of the by-pass valve by means connected to the water gate operating means in an inverse direction to that which the water gate is operated.

Q. 211. And in both directions inversely?

A. No; not inversely.

Q. 212. I mean in my last question, going back to the original wording of the claim,—I am asking whether with the substitution of the words “both directions” for the words “either direction” in line 3 of Claim 6, if, as you have just testified, the claim would mean that the water gate is to be moved in both directions, the operating means would likewise be understood as moving the by-pass in both directions inversely, or what do you make out as to this?

A. Not necessarily. Because the disclosures of the patent clearly set forth this fact: that the means that operate the by-pass valve are connected with the water-gate-opening means, and it does not necessarily follow with the use of the words “both directions” instead of “either direction” that the means connected to the water-gate-opening means might or might not simultaneously operate the water gate inversely to the operation of the by-pass valve. But, as I interpret the disclosures of the patent, the use of the word “either” gives a broader use for the devices as disclosed in the patent, since by operating the water gate in either direction, and since the by-pass valve is operated by means connected to the water-gate-operating means, that necessarily the water gate and the by-pass valve will be operated inversely. The distinction is clear in this: The operation of the by-pass valve is not due to the operation of the water gate. The operation of the by-pass valve is due to the same means that is connected with the water-gate-operating means. In

other words, the same means operates both the water-gate-operating and the by-pass valve.

Q. 213. Now, in view of the use of this language relating to operating the water gate in either direction, supposing you encounter a construction embodying the invention in which the water gate and the by-pass operated together only in the closing direction of the water gate during governing, and likewise encounter another construction in which the water gate and the by-pass operated together only in opening of the water gate in the governing action. Would you draw any distinction between these two cases in reading the language of Claim 6?

A. Yes, sir; because in the cases that you have indicated the water gate would not be operated in both directions but would be operated in but one direction or possibly in either direction, but they would not be operated in both.

Q. 214. You do not find the word "both" in Claim 6, do you?

A. I do not.

Q. 215. It is for that reason that I have asked you whether you would draw any distinction between the constructions in which, in one case, the by-pass and water gate operate simultaneously with the movement of the water gate only in one direction, and another case in which the by-pass and water gate move simultaneously only in the operation of the water gate in the other direction.

A. I would draw absolutely no distinction, as actually set forth in Claim 6 where the words "either direc-

tion'' are used. There is absolutely no distinction in the cases you have given, but there would be a distinction if the words ''both directions'' were used, most certainly. Because in the two cases you have indicated you would by the restriction set forth allow the operation of one gate to be in only one direction and not in both directions.

Q. 216. That is, the operation of the water gate jointly with the by-pass as stated in my question?

A. Yes, sir.

Q. 217. Then am I to understand that in accordance with your comprehension of the import of said Claim 6 of the Lyndon patent either of the cases which I have put would come within the reading of said claim?

A. Yes, sir; not only that claim, but in every one of those claims where invariably you find the equivalent of the expression ''operating the water gate in either direction.''

Q. 218. And that applies to all of Claims 3 to 9 which I first mentioned, does it? Of course, leaving out of consideration the by-pass when dealing with Claims 3 and 4, which do not specify a by-pass.

A. Yes; but there is in Claim 3, line 3, the words ''operating same,'' referring to the water-gate-operating shaft ''in either direction.'' In Claim 4, line 4 and 5 of that claim ''adapted to turn the water-gate-operating shaft in either direction.''

Q. 219. That I understood. But I mean in such of those claims in which no by-pass itself is specified.

A. The by-pass itself is specified in Claim 6 as above indicated.

Q. 220. I mean does your answer with respect to the differentiation between "both" and "either" apply to the other claims, such as 3 and 4, in which a by-pass is not specifically set forth?

A. No. Where mention of the by-pass is not made the distinction would not apply, but would apply in Claims 6, 7 and 8 where the words "either direction" are to be found in connection with the operation of the water gate and it is set forth that the by-pass is operated inversely to the control of the water gate.

Q. 221. Now, as to those claims in which that inverse operation of the by-pass is not specifically set forth, such as Claims 3, 4, 5 and 9, but in which the language "either direction" is employed with respect to the operation of the water gate, in so far as that language is controlling, would you or would you not draw a corresponding distinction as between the same and the language "both directions"?

A. I do not know how to answer your question any better than by saying the use of the words "either direction" certainly does not mean "both directions." They cannot possibly be interpreted to mean the same thing, because they did not. And, further, Claims 3, 4, 5 and 9 clearly, to my mind, will allow the operation of the water gate in either direction as is stated without necessarily at the same time the operation of the by-pass valve. The by-pass valve may be not simultaneously operated, or may not be operated at all. Now, every one of these claims specifically states the combination of a water-gate-operating shaft and means for operating the same in "either direction," and if any

kind of a device is provided for the operation of the water-gate-operating shaft in either one direction or the other, it is specifically in accordance with the specifications of the claim. But the use of the words "both directions" naturally would not include a mechanism to be operated in one direction only, but the words "either direction" include the device even if only operated in one direction.

Q. 222. I think that clears that matter. Now I will call your attention to Complainant's Exhibit W and ask whether you are acquainted with any such apparatus.

A. I am. I have been acquainted with the device for some time.

Q. 223. Can you state what such apparatus is known as in the art or in the trade?

A. I do not know that I can give it any particular trade name except that I know for what use it is employed in governing mechanisms, particularly for water wheels.

Q. 224. Have you ever seen such a device installed in connection with a water wheel?

A. I have—a number of them.

Q. 225. What is its general purpose in such installations.

Mr. Westall: Objected to as incompetent, irrelevant and immaterial.

A. I should say its purpose is in general to accomplish the following very desirable action in a water wheel governor: after the water gate has been presumably or approximately moved to position required for the return or regulation of the normal speed, it is desir-

able to have that water gate stay in that position until, if the water gate has been moved exactly in the right position, it will stay there and not be moved any further by action of the governor mechanism until normal speed has been restored. And that is the object of this mechanism, to so adjust itself with the controlling device which is responsive to change of speed so that normal conditions can be restored in reference to the operation of the entire system without causing the water gate valve to be further operated upon due to a movement of the controller out of its normal position.

Q. 226. Does this device accomplish that purpose?

A. It certainly does.

Q. 227. Please look among the blue prints upon the table and see if you can find any print in which there is a representation of such a device, and give us the identification of the blue print.

A. On Complainant's Exhibit ZZ.

Q. 228. How upon that blue print is this device designated?

A. Well, it is designated, I should say, by the words "automatically controlled returning dashpot." It is under the control absolutely of the governor which is operated due to changes in speed of the main water wheel shaft.

Q. 229. Now, assuming that the several other features of this blue print correctly represent features which will operate in accordance with the general broad designations applied to them in red lettering, I will ask you if upon consideration—and you may take such time to consider as you wish—you can state the mode of oper-

ation and the functions of this automatically controlled returning dashpot shown therein. In the first place, I will ask you if this showing on the blue print has any particular name in the art or trade—that is, the whole combination of the parts represented here.

A. Do you mean commercial or technical name?

Q. 230. Commercial preferably.

A. I regard this as representing the aggregate of the devices commonly in use for the regulation of the speed of water wheels as developed in the so-called Lombard governor which is connected to the water gate valve and nozzle; also a by-pass valve for such water wheel.

Q. 231. Please look at Complainant's Exhibits E to L and state if you find therein any representation of such a Lombard governing device and, if so, please point the same out by any reference letters you find on such photographic exhibits.

A. On Exhibit J I find the photograph of a governor mechanism including the parts. Fly-ball element CC is responsive to variations in speed of the main water wheel. On Exhibit C the dashpot labeled "dashpot," the adjustable screw YY on both Exhibits J and K—

Q. 232. My question is as to the whole governing device of the Lombard governor and not necessarily the dashpot.

A. The governor broadly is represented by the photographs Exhibits J and K.

Q. 233. Specify the parts.

A. The pulley DD which is maintained at the same speed as the main water wheel shaft; the governing

mechanism is also shown on Exhibit G. Is it your desire that I shall try to name all these various things all the way through?

Q. 234. No; just the parts so and so.

A. You don't want me to try and name every one of them?

Q. 235. No. Point them out by the designating letters.

A. Referring to Exhibits J, K and H, I note the parts of the governing mechanism, as before stated, CC, DD, UU, ZZ, XX, VV, EE, FF, II, PP, LL, KK, NN, SS, MM, TT, AA. On Exhibits E and G the following letters, referring to the various parts of the governing mechanism: I, A, K, L, M, G, H, F, D, E, X, Z.

Q. 236. Now do you find in these several photographs the counterpart of the governing device shown in Complainant's Exhibit ZZ?

A. I do.

Q. 237. Will you please now state briefly the operation of this governor device shown in Complainant's Exhibit ZZ, and it may assist you to abbreviate it by referring to the several parts substantially in the language of the notations on the blue print where you can do so.

A. Referring to Complainant's Exhibit ZZ, the fly-balls CC are affected by change of speed of the main water wheel through the main driving shaft. The operation of the fly-balls will operate the controller through the stem YG so as to move it away from its normal position when the speed of the main water wheel for any reason changes to other than normal. The controller then acts through a means which is labeled "operating

cylinder," and which is really a means for operating the water gate in either direction, or, if desirable, a combination of a water gate and a by-pass valve, the result being that a change in speed will cause the position of the water gate to be modified. The automatically controlled dashpot is in reality a returning device controlled by the controller which will on returning to its normal position keep the position of the water gate constant until the speed has readjusted itself in the main water wheel to normal, or until it has adjusted itself approximately to normal, at which time the controller will again if necessary make a further adjustment of the water wheel opening. The operation of the automatically controlled returning dashpot which is controlled through the controller is to maintain the position of the controller in a normal position until the speed has returned to normal. This is accomplished through a clutch bar operating at ZZ which allows the returning dashpot to return to its original position at just the proper rate during the time of its movement, so that the controller itself will not be moved from its normal position, due to the change of the position of fly-balls as the speed is being adjusted to normal. Further, the automatically controlled returning dashpot will operate to accomplish this result in exactly the proper manner in both of the following cases: If the operation of the governor has been to reduce the speed due to its having been previously increased because of a reduction of the load on the water wheel, or, vice versa, if the operation of the governor has been to increase the speed due to an increase in the load on the water wheel. I wish it understood that what I have said in regard to

the operation of the automatically controlled returning dashpot is due primarily to excessive or large and sudden changes of speed, and the operating of the governor therewith, rather than necessarily to very slight modifications of speed from normal for any reason.

Mr. Westall: Counsel for defendant calls the attention of the court to the fact that in the foregoing testimony of his witness he has had before him Complainant's Exhibit ZZ which, upon the previous examination of Complainant were marked by Complainant in red pencil what he conceived to be the mechanical equivalents of certain of the elements of the claims in suit, and that therefore the testimony of this witness should not be entitled to the weight that it would otherwise be entitled to if the witness were testifying from a drawing which had not been so marked.

Mr. Blakeslee: The very question admitted the marking of this drawing, and the question was not directed at comparing this structure with the Lyndon patent or any disclosure thereof, but it was merely directed at the operation of this governor device.

Q. 238. Now, in the action of such governor what can you say as to the rate of movement of the fly-balls during their inward and outward play?

A. The fly-balls are returning to their normal position there, but with movement during the early part of their return at a comparatively rapid rate. That rate will become slower and slower till it will be a minimum just before they come to their final and normal position. While on the other hand, if the fly-balls are being thrown out, due to an increase of speed, the rate at which they

will be thrown out will be greater during the first part of the travel of the fly-balls, such rate becoming less and less as they tend to get to their position furthest out.

Q. 239. Now, have you anything to say as to the relation between this varying rate of travel of the fly-balls and the action of any parts of the governor which you are describing with reference to Complainant's Exhibit ZZ?

A. Yes, sir; I have this to say: that is, that the returning of the fly-balls to position corresponding to normal speed, being at a varying rate during their time of travel, the action of the automatically-controlled returning dashpot due to either detention or compression, depending on which direction is traveled, the controlling springs will be such that the rate at which the balls move to their normal position will be exactly equalled or compensated for by the relative motion of the automatically-controlled dashpot to its normal position, connected with the rack that is in mesh with the gear pinion UU-J.

Q. 240. With what spring action, as indicated in Exhibit ZZ?

A. A spiral spring.

Q. 241. And having what action in the exertion of its spring quality?

A. It tends to move a rack that is geared with a pinion UU-J. It is a means of transmitting motion to that rack.

Q. 242. What I mean more particularly is, how would you define that spring itself, taken with respect to the exertion of its spring quality?

A. It is the means for returning the rack to its normal position. The work which you have done on the spring when either compressing it or extending it is utilized to return the gear, under control, however, of the controller, to normal position.

Q. 243. In other words, it always works to restore the rack to a normal position?

A. It does, yes, no matter in which direction the rack may have been moved.

Q. 244. Please now describe how the automatically-controlled returning dashpot operates in conjunction with the returning device and the controller or controller valve.

Mr. Westall: Counsel for the defendant again suggests that if some other drawing or representation of the devices inquired about are presented to the witness instead of the one previously marked by the witness Henry, that the weight of the testimony of this witness would be greatly increased.

A. I am perfectly willing to testify from any blue print so it is lettered to refer to the different parts. The writing on this blue print has no effect on my testimony whatever. The controller or controller valves move so as to place the water gate mechanism in motion due to a change of speed of the main water wheel transmitted to the fly-ball governor. If the movement of the water gate required is excessive, due to sudden or excessive change in the speed, the automatically controlled or returning dashpot will be moved, since it is directly connected with the means for operating the water gate, marked GG-H on the blue print, so that the clutch bar will

be raised on its seat ZZ, which will in turn raise the adjustable pin YY, allowing freedom of motion for the oil between the piston of the dashpot and the cylinder of the dashpot, thereby increasing the rate at which the dashpot itself will be returned to its normal position by the action of the spiral spring which transmits its action to the rack geared with the pinion UU-J on the stem of the controller. The action of the automatically controlled returning dashpot is such that the fly-balls will return at a rapid rate at first, but at a constantly decreasing rate, until they arrive at their final position, co-incident with the operation of the automatically controlled dashpot due to closing up of the orifice through which the oil may pass, due to the dropping down of the adjustable pin YY to its seat as the result of the movement of the clutch-bar to the lowest point at which it may rest in its slot ZZ.

Q. 245. By Mr. Blakeslee: And how does this joint action of the fly-balls and the dashpot affect the movement of the controller valve?

A. It maintains the controller valve in a neutral position so that the water gate is not again moved until it is required to be moved by a position of the fly-ball governor out of normal position, corresponding to the normal speed.

Q. 246. And if this ratio were not obtained between the more rapid movement of the fly-balls and the correspondingly more rapid movement of the dashpot and of the rack and pinion, what would result with respect to the controller valve and the second action of the governor upon the water wheel?

A. The controller valve would be moved from its neutral position and the governing mechanism might be such as to overrun and move the gate valve either further open or further closed than required by the change of load. This device absolutely prevents the governor from overrunning, as I have described it.

Q. 247. What do you consider the effect of this operation of the governor to be with respect to good governing action?

A. In my experience you could not possibly even get satisfactory governor action at widely varying speed due to sudden changes of load, without this mutually actuating device, namely, the automatically operated dashpot which is always under the control of the controller and the position of the fly-balls as affected by the speed of the wheel itself.

Q. 248. I show you Complainant's Exhibit X and ask if you find therein anything which relates to any of the features of the governor shown in Complainant's Exhibit ZZ which you have been discussing.

A. I find in Figure 30, 31, 33, 34 and 35 the various portions of the mechanism regarding which I have been testifying.

Q. 249. Now, please look again at Complainant's Exhibit W and state if you find any differences between what you find there and the corresponding parts of Complainant's Exhibit ZZ.

A. I find no essential differences whatsoever except, possibly, the representation of the spring and rack upon the drawing are shown vertically instead of, as they actually are constructed here, horizontal. The parts

of Complainant's Exhibit W are there represented upon Complainant's Exhibit ZZ in substantial consideration with the rest of the mechanism.

Q. 250. The rack is in the same plane?

A. Yes, sir; but the spring and controlling fingers are not.

Q. 251. Does that make any essential difference at all?

A. None whatsoever.

Q. 252. Now, I will call your attention to Complainant's Exhibit KK, not for the purpose of comparing the same with the drawings and specifications of the patent in suit, but simply for the purpose of comparison with Complainant's Exhibit ZZ, W and X, and I will ask you if you find shown in this Exhibit KK any of the features shown in those other three exhibits.

A. Referring to Exhibit KK I do find therein set forth upon the blue print itself the various devices that are in part upon each exhibit set forth in Complainant's Exhibit ZZ, W and Complainant's Exhibit X.

Q. 253. At what part of the blue print are these shown?

A. They are shown upon the main blue print itself. Complainant's Exhibit W is represented toward the upper part of Complainant's Exhibit KK. Complainant's Exhibit ZZ is reproduced upon the upper portion of Complainant's Exhibit KK, and Complainant's Exhibit X, especially Figures 30, 31, 33, 34 and 35, are shown on the upper portion of the blue print, being Complainant's Exhibit KK.

Q. 254. Is the construction of this blue print KK

clear to you as to its connection and the resultant operation of the parts?

A. It is.

Q. 255. Do you find any material differences between the showing therein and the construction and operation of the features disclosed in Exhibit ZZ, W and X?

A. No, I do not, with the possible exception that Complainant's Exhibit ZZ might be thought of, as testified, to operate horizontally, while KK represents a device to normally operate vertically.

Q. 256. And what particular part is vertical in one and horizontal in the other?

A. The means for operating the water gate is represented as operated horizontally in ZZ and vertically in Complainant's Exhibit KK.

Q. 257. Referring now to Complainant's Exhibit U and V, do you find in Complainant's Exhibit KK any representation of what is shown generally in either of the same?

A. I do find on the lower part of the blue print Complainant's Exhibit KK a substantial reproduction of the parts as shown upon Complainant's Exhibit U and V.

Q. 258. Referring to Complainant's Exhibits E to L, can you draw any comparison of what is shown therein and what is shown in Complainant's Exhibit U and V, to what is shown in Complainant's Exhibit KK?

A. Referring to Complainant's Exhibit H, I, J, and K, and Complainant's Exhibits E, G and F, I find the various parts represented on Complainant's Exhibit KK, or the different parts of the governor mechanism which

I identified, as also being shown on Complainant's Exhibit KK, are shown by letters and lines drawn indicating the component parts of the governor mechanism as shown in the photographs.

Q. 259. And these parts of the governor mechanism are the same as those which you just previously testified to in examining the photographs?

A. Yes, sir.

Q. 260. Now, Mr. Cory, as to any contradictions, if any exist, as between any parts of your testimony, which statements do you wish to stand as final—the earlier or latter statements?

A. If there be such apparent or real conflicting statements in my testimony, I should wish to have the later statements to be understood as my testimony, since in the attempt to formulate an answer to an involved question, either the wording that I may have used may have been incorrect, or my interpretation of the meaning of the question may have been erroneous; and I therefore wish to have understood as my testimony the later statements that may be so made, if such conflicting statements may be found in my testimony.

Q. 261. Considering broadly and finally the invention of the Lyndon patent in suit and also the disclosures of Exhibits E to L inclusive and blue print Exhibit KK and blue print ZZ and the device Exhibit W, and the drawings U and V, are you able to draw any distinction as between the disclosure of the invention of the Lyndon patent in suit and the general mode of operation and results obtained in the operation of the mechanism as portrayed in the other exhibits?

A. There are no distinctions whatsoever as to the results accomplished as affected by a change of speed in the water wheel shaft in the disclosures of the Lyndon patent as compared with the Complainant's Exhibits which you have mentioned in your question.

Mr. Blakeslee: You may cross-examine.

CROSS-EXAMINATION.

By Mr. Westall:

Q. 262. Counsel has inquired particularly with reference to the claims other than Claims 1 and 2 of the patent. Do you fail to find in the alleged infringing devices as represented by the blue prints and photographs about which you have testified, the mechanical equivalents of Claims 1 and 2 of the patent?

Mr. Blakeslee: It is to be noted that the last question put to the witness on direct examination was pertinent to the entire disclosure of the Lyndon patent in suit.

A. No; I do not so claim to find.

Q. 263. By Mr. Westall: So that if I have understood the purport of your testimony, you find the mechanical equivalents of all of the claims of the Lyndon patent in suit in the alleged infringing illustrations about which you have testified?

A. No; I do not find the equivalent—actual physical structures—but I find the mechanical equivalent of the results and operations obtained. For instance, I do not find a dynamo which is specifically stated in Claim 1, but I find in Complainant's Exhibits the mechanical equivalent in the resulting operation.

Q. 264. So that what you find is really an equival-

ence in result rather than means?

A. Well, equivalence in result and equivalence in means in obtaining that result. But in the physical equality of the means themselves, I do not so find.

Q. 265. What part or parts do you understand are meant by the reversing clutch gear mentioned as elements in Claims 1, 2, 4 and 5 in the patent in suit?

A. Parts 9 and 10 and 11, being bevel gears, and sleeve 13, friction discs 13A and 13B, adapted for moving the water gate in either direction.

Q. Please point out where, if at all, you find in any of the alleged infringing devices a clutch-gear adapted to connect the water-gate-operating shaft to the driving shaft in reverse driving relations, as described in Claim 1 of the Lyndon patent?

A. I do not find in Complainant's exhibits the physical equivalent of the reversing clutch-gear; but I find the equivalent as far as result is concerned in the—

Q. 267. (Interrupting). Counsel for defendant suggests that in making answers to these questions the witness do not refer to Exhibit KK which has been marked by the witness Henry on his prior examination, and it is believed that the testimony given without any such reference to such exhibit be of much greater weight than if the witness is permitted to follow the suggestions made by the witness Henry in his prior examination.

Mr. Blakeslee: We will suggest to the witness that he refer to photographs E to L.

A. If it is proper to go on the record, the witness would like to say that he does not intend at all to refer to Complainant's Exhibit KK, and is perfectly willing

to refer to any representation which can be interpreted. I do not find, however, the photographs in all cases so clear as to be able to pick out the various parts as may be required by the question.

Mr. Blakeslee: Let the witness refer to any parts that he may find in these photographs. We would rather have the photographs used if you can use them.

A. All right, but I am afraid I will make errors in picking out the various parts. Referring to the blue print which is a duplicate of the blue print used in making KK, and which I have marked KKK, there being no marks whatsoever on blue print KKK, I indicate by the capital letter A the equivalent of the reversing-clutch-gear adapted to operate the water-gate-operating shaft in either direction upon the device which is represented upon blue print KKK, being a cylinder with a piston therein capable of being operated in either direction.

Q. 268. By Mr. Westall: Do you include any other parts than the cylinder casing and the piston as the equivalent of the reversing-clutch-gear mentioned in the last question?

A. No; I include nothing more than the cylinder with its inlet valves, and so on—the cylinder in the comprehensive sense.

Q. 269. By “its inlet valves” do you include anything but merely the openings of those valves, or what other mechanism?

A. I do not include any valves, because there are none. There are pipes.

Q. 270. Do you include the pipes?

A. To either end of the cylinder.

Q. 271. How much of the pipes do you include?

A. It includes the pipes that enter in the cylinder walls or the openings in the cylinder. I could answer that question best by saying that I include nothing but the cylinder as ordinarily understood, with its attachments and the piston operating therein.

Q. 272. Is it not a fact that the clutch-gear mentioned in the immediately preceding questions perform two functions: one, to act as a sort of ^acoupling link between two shafts, and, the second, as a vehicle through which energy is imparted to move other parts? Is that correct?

A. Well, if a coupling link is supposed to be equivalent to a clutch, the reversing-clutch-gear does perform those two functions.

Q. 273. Does the cylinder with its piston which you have pointed out perform those two functions?

A. As far as the resulting motions is concerned, yes. Because the piston within the cylinder may remain perfectly stationary, no matter how rapidly the main water wheel shaft rotates, just the same as the gear 11 may remain stationary, no matter how rapidly the water wheel shaft rotates.

Q. 274. To what part is the piston in the cylinder more closely analagous in the parts you have heretofore mentioned?

A. It is perhaps more closely analagous to the bevel gear 11, because when the bevel gear 11 is caused to operate the result is a direct action in either opening or closing the water gate, exactly the same way when the piston within the cylinder which I have marked A

operates; the result is an opening or a closing of the water gate.

Q. 275. Can the part or parts which you have pointed out as being the mechanical equivalents of a "reversing clutch-gear" be described as "being adapted to connect the water-gate-operating shaft to the driving shaft in reverse driving relations" within the meaning of Claim 1 of the patent in suit?

A. Yes sir; because that is exactly what the piston A within the cylinder A does do.

Q. 276. The piston A you say does that?

A. The piston within the cylinder A. The motion of the piston A within the cylinder performs every function that is performed by the bevel gear 11 with the reversing clutch-gear.

Q. 277. Can said parts that you have pointed out as the reversing clutch-gear be described as being adapted to turn the water-gate-operating shaft in either direction within the meaning of Claim 4 of the patent in suit?

A. Yes, sir.

Q. 278. Can it properly be said that the water-gate-operating shaft is turned in the alleged infringing devices in the same sense that the operating shaft is turned in the patent in suit?

A. Yes, sir; in exactly the same relation. Because in the operation of the Lyndon patent it is quite possible that bevel gear 11 will be moved very slowly in order to operate the water gate to a sufficient degree. Just so it is possible that the motion of the piston A will be moved relatively slowly in order to operate the shaft or rotate the shaft.

Q. 279. I don't believe you understood my last question.

(The question is read by the Examiner.)

A. Yes, sir; in both cases the water-gate-operating shaft is turned. It is rotated.

Q. 280. Which part do you mean as the water-gate-operating shaft?

A. In the Lyndon patent I think it is so described as shaft 20. Yes. That would be my understanding from the description. It is shaft 20.

Q. 281. Please point out in the patent in suit what part or parts you understand are meant by "means for reversely controlling the operation of such clutch-gear" as used in Claim 1 of the patent in suit?

A. Means for reversely operating such clutch-gear consists of electro-magnets 15 and 16 which may be made to attract their armatures 17, thereby engaging friction discs 13A or 13B, so as to either rotate gears 9 or 10, the direction of rotation of the water-gate-operating shaft depending upon whether clutch-gear 9 or clutch-gear 10 is made to operate with shaft 6.

Q. 282. I will ask you now to briefly indicate where, if at all, you find an element or elements in any of the alleged infringing devices which could be appropriately described as "means for reversely controlling the operation" of the parts which you have pointed out as being the equivalent of said reversing clutch-gear, within the meaning of said Claim 1.

A. The means for reversely operating the piston within cylinder A is the controller cylinder with its pair of pistons which I mark B. This controller being oper-

ated by a variation of the speed of the main water wheel which will change the position of the fly-balls of the governor, which latter balls are marked C, in the same manner as the operation of the speed of the main water wheel shaft in the Lyndon patent through the dynamo 8 and the coils 15 and 16 and the clutch-gear consisting of loose bevel gears 9 and 10 are caused to mesh with bevel gear 11.

Q. 283. In your opinion is the "electro-magnetic means controlling such clutch-gear" called for in Claim 2 of the patent, the exact equivalent of the "means for reversely controlling the operation of such clutch-gear" pointed out in the alleged infringing devices?

A. "Means for reversely controlling the operation of such clutch-gear", as called for in the patent in suit, are not the physical equivalents of the means called for in the alleged infringement. But in their operation the means are identical in the two cases.

Q. 284. By "being identical" do you mean that they effect the same result?

A. Yes, sir; they serve the same purpose and accomplish the same thing.

Q. 285. Do you find in the alleged infringing devices any such "electro-magnetic means controlling such clutch-gear"?

A. I find no electro-magnetic means whatsoever in the alleged infringements.

Mr. Blakeslee: Again the Complainant concedes that there is no electro-magnet shown in the alleged infringing structure.

Q. 286. By Mr. Westall: In your opinion does Claim

2 mean the same, so far as its application to the alleged infringing devices is concerned, with the word "electro-magnetic" stricken out?

A. As I understand, it would not mean the same in the sense that it is to be understood as set forth in Claim 2, that the means controlling such clutch-gear is to be amplified by stating that the means are electro-magnetic means, while in the alleged infringement the means are not electro-magnetic, and that term would therefore not be interpreted as meaning fully the same as if the words "electro-magnetic" were left out.

Q. 287. But, so far as your application of the equivalence of the two structures is concerned, whether the word "electro-magnetic" is left in the claim or not makes no particular difference? Is that not correct?

A. It makes no difference in the result of the operation of the device as to what kind of means is adapted, whether electro-magnetic or mechanical.

Q. 288. Please point out where, if at all, in the alleged infringing device you find "a dynamo connected to be driven from the water wheel and wound to maintain constant potential for varying currents therein, but to vary the potential in a greater ratio than the speed", within the meaning of Claim 1 of the patent in suit?

A. I find no such dynamo in the alleged infringement

Q. 289. Do you find its mechanical equivalent?

A. I do.

Q. 290. Please point out in the alleged infringing devices where you find its mechanical equivalent.

A. The mechanical equivalent is the governor balls, the position of these balls and the mechanism connected

therewith being affected in exactly the same way as the change in speed in the main water wheel shaft affects the electro motive force of the dynamo in the Lyndon patent.

Q. 291. Please point out in the drawings in the patent in suit the part or parts which you understand are meant by "an electro-magnetic device connected to such dynamo and controlling the clutch-gear-controlling means", as called for by Claim 1 of the patent in suit?

A. Electro-magnet 33.

Q. 292. Still referring to the same language quoted in the last preceding question, please point out the part or parts of the Lyndon patent which you conceive to be the "clutch-gear-controlling means" in the Lyndon patent in suit.

A. Indicating the clutch-gear-controlling means in the Lyndon patent, I would say that the controlling means was the electro-magnet 33 with its core 34, in the link 35 and the lever arms 26, the electrical contacts 40 and 40A, and 41 and 41A.

Q. 293. Referring now to the alleged infringing devices as illustrated, where, if at all, do you find an electro-magnetic device connected to such dynamo and controlling the clutch-gear-controlling means as called for in said Claim 1 of the patent in suit, or its mechanical equivalent?

A. I do not find such electro-magnetic device, but I find the equivalent in the controller cylinder and its pair of pistons that I have previously marked B upon the blue print KKK.

Q. 294. What part or parts in the alleged infringing

device do you conceive to be appropriately described as "clutch-gear-controlling means?"

A. The equivalent of the clutch-gear-controlling means of the Lyndon patent is to be found in the controlling cylinder with its pair of pistons operating therein, which I have marked B on the blue print KKK.

Q. 295. Can the parts which you have just pointed out as being the mechanical equivalent of the electro-magnet device as called for in said claim one, be said to be controlling those parts which have been pointed out as being the mechanical equivalents of the clutch-gear-controlling means of said Claim 1?

A. Yes, sir; in exactly the same manner and with the same result.

Q. 296. Please point out in the Lyndon patent in suit the part or parts which you understand in Claim 1 are "means for resisting the action of said electro-magnetic device".

Mr. Blakeslee: Objected to as incomplete, without the portions of said Claim 1 which clearly qualify this phrase.

A. Springs 37-38 and 27-28 and 29, and also springs directly underneath magnet coils 15 and 16, but which are not lettered.

Q. 297. By Mr. Westall: Please point out where, if at all, you find "means for resisting" the action of the parts which you have designated as the mechanical equivalents of said electro-magnetic device, within the meaning of Claim 1 of the patent in suit, in said alleged infringing device, or where, if at all, you find their mechanical equivalents.

A. The mechanical equivalent for resisting the motion

of the action is to be found in the alleged infringement by the pressure fluid contained and capable of being admitted and discharged within the controlling cylinder B.

Q. 298. Can it be said that the parts you have pointed out as the mechanical equivalent of "means for resisting the action of said electro-magnetic device" resist the action of the parts which you have pointed out as being the equivalents of said electro-magnetic device in such manner that at normal speed the parts that you have pointed out as the mechanical equivalents of the "clutch mechanism" will be disengaged, but on increase or decrease from normal speed the parts you have pointed out as the mechanical equivalents of the "clutch" will be operated to govern the water gate through its operating shaft as described in Claim 1?

A. Yes; I find the mechanical equivalent in the alleged infringement, since the word "disengaged" as used in line 125 of page 4, of Claim 1, corresponds exactly to the condition when the pair of pistons in the controlling cylinder prevent either the inlet or the outlet of oil to the cylinder A as marked on KKK.

Q. 299. Is there is ^{is} disengagement in the same sense as used in the patent in suit?

A. There is; exactly in the same sense, the word "disengaged" in Claim 1 referring to the conditions set forth in the Lyndon patent in the reversing clutch-gear is not moving the water gate thereof, and in exactly the same way in the alleged infringement the means tending to operate and to rotate the shaft of the water gate is disengaged in operating.

Q. 300. What part do you understand is meant by

the language of Claim 2, "a solenoid connected to said dynamo" in the Lyndon patent?

A. Solenoid 33.

Q. 301. Where, if at all, in the infringing devices do you find the solenoid or its mechanical equivalent?

A. I find no solenoid but I find its equivalent in the pair of pistons marked B on blue print KKK.

Q. 302. The sole function of solenoid 33 in the patent in suit is make and break certain electrical circuits, is it not?

A. Yes, sir.

Q. 303. Said solenoid does not move either the water gate or the by-pass valve. Is that correct?

A. Correct.

Q. 304. Its only function is to make such connections as will permit the water wheel to operate the water gate and the by-pas valve. Is that correct?

A. That is correct.

Q. 305. Now, if we ~~would~~^{could} imagine a mechanical brakeman supplied with energy from the locomotive of a railway train with which he is connected, whose duty or function is like the living brakeman now in use, to couple and uncouple cars of the train with which he is connected, but who does not assist the locomotive in moving the train, would we not have a good conception of the function performed by the solenoid 33?

A. No; I don't think that is an appropriate analogy.

Q. 306. In what respect is it inappropriate?

Mr. Blakeslee: Objected to as irrelevant, immaterial, incompetent, and a direct comparison of the parts, devices, etc. of the patent and the alleged infringing de-

VICES does not necessitate such attempted analogies, and it is believed the witness is competent to make his comparison or contrast without the assistance of any such analogous suppositions.

A. Because the coupling or uncoupling of cars in the operation of a train with respect to the mechanical parts of the engine, is not at all analagous to making or breaking of electrical circuits by means of the operation of the solenoid 33 and its soft iron core 34.

Q. 307. By Mr. Westall: Isn't it a fact that the part which you have pointed out as the mechanical equivalent of the solenoid 33 does not perform any coupling function like the solenoid 33, but, to follow out the figure of the last preceding question, is rather analagous to the cylinder of the locomotive in that it is one of the means through which energy is conveyed in our illustration to propel the train and, in the alleged infringing devices, to move the water gate.

Mr. Blakeslee: The same objection, and the further objection that it is not cross-examination, and it is not recollected that the term "coupling" has entered into any of the testimony of the present witness or enters into the disclosure of the Lyndon patent.

A. No. The controlling magnet³³ with its soft iron core 34 of the Lyndon patent operates in exactly the same manner as the controlling cylinder with its pair of pistons which I have marked B on blue print KKK to connect or disconnect the operating part from the water wheel gate shaft in exactly the same way in the Lyndon patent as in the alleged infringement. The operating part is connected and disconnected from the cylinder A

with its piston and rod connected to the water-gate shaft. In other words, the controlling cylinder B does disconnect the cylinder A with its piston therein so that the water wheel shaft is not operated except when desired, exactly the same way as in the case of the Lyndon patent with the controlling magnet 33 and the water ~~gate~~ wheel shaft 20.

Q. 308. By Mr. Westall: Taking the parts that you have pointed out as the equivalent of the solenoid in Claim 2 and the fly-balls as the equivalent of the dynamo of the same Claim, can it be properly ~~be~~ said to follow the language of said Claim that the part you have pointed out as the equivalent of the solenoid is connected to the fly-balls in the same sense as used in the language of the claim quoted?

A. Yes, because in the language of Claim 2 "a dynamo connected to be driven by the water wheel" and, further, "a solenoid connected to said dynamo and a device controlled by said solenoid" bear the same relation to one another as the fly-balls of the governor in the alleged infringement as set forth in blue print KKK bears to the controlling cylinder B. In the case of the Lyndon patent that connection is electrical, and in the case of the infringement the connection is mechanical. But the resultant operation in both cases is the same, namely, that the variation of the speed of the main water wheel shaft will affect the controlling device.

Q. 309. Now, the part that you have pointed out as the mechanical equivalent of the solenoid, can it be properly said to be energized by the part or parts which you

have pointed out as the mechanical ^{equivalent} of the dynamo, within the meaning of Claim 5 of the patent in suit?

A. Yes; they are the mechanical equivalent, although in the Lyndon patent electrical circuits are used while in the alleged infringement the device and means are mechanical.

Q. 310. Where, if at all, in the infringing devices, do you find the mechanical equivalents of Claim 5 in the patent in suit to the "core for said solenoid and a circuit controller actuated thereby, springs for holding the circuit controller in normal position"?

A. I find the mechanical equivalent in controlling cylinder B as marked upon blue print KKK, with its pair of pistons.

Q. 311. Which part do you consider the mechanical equivalent of the core of such solenoid?

A. I find nothing that can be considered as the mechanical equivalent for the core only.

Q. 312. Do you find the mechanical equivalent of the circuit controller actuated thereby only?

A. No; I find no equivalent for the circuit controller.

Q. 313. Do you find springs for holding the circuit controller in normal position?

A. No, sir.

Q. 314. Nor the mechanical equivalent?

A. Nor the mechanical equivalent.

Q. 315. Please also point out where, if at all, in the alleged infringing devices you find the mechanical equivalents of two electro-magnetic devices called for in Claim 5 of the patent in suit.

A. I find the mechanical equivalent of the two electro-

magnetic devices for reversely operating the reversing clutch-gear, in the two pipes leading from the controlling cylinder B to the cylinder A with its piston therein.

Q. 316. Will you please indicate by a red pencil as you have indicated before?

A. By the pipes which I now indicate with the letter D.

Q. 317. The two pipes which you have just indicated have already been referred to by you and indicated as part of the devices which you have pointed out as the equivalent of the solenoid? Is that not correct?

A. No, sir. The two pipes D are a means for connecting the controlling cylinder B to the cylinder A in exactly the same manner as the electro-magnetic devices in the Lyndon patent are used for connecting the solenoid 33 with the reversing-clutch-gear consisting of movable bevel gears 9 and 10, so that either can be engaged with bevel gear 11.

Q. 318. Still referring to the language of Claim 2 of the patent in suit, please point out what part or parts you understand are meant by "a device controlled by said solenoid and carrying a contact device"?

A. Parts consisting of lever arms 26, pivoted at center 26A, contacts 40 and 40A, and 41 and 41A.

Q. 319. Please point out in the alleged infringing device the part or parts which in your opinion constitute the mechanical equivalent for "a device controlled by said solenoid and carrying a contact device" as called for in said Claim 2.

A. I find no physical mechanical equivalent to a contact device.

Q. 320. Do you find any kind of an equivalent?

A. Yes; I find that equivalent in the pipes DD.

Q. 321. Can the pipes DD be said appropriately to carry a contact device?

A. No, sir; they do not. But they serve in exactly the same manner as the contact devices of the Lyndon patent in suit to connect the controlling cylinder D to the cylinder A, as these contacts connect the controlling solenoid 33 with the clutch mechanism reversing clutch, reversing-clutch-gear, consisting essentially of bevel gears 9, 10 and 11.

Q. 322. Do you find anything in the alleged infringing devices which could without abuse of language be described as "energizing connections for the electro-magnetic gear-controlling means", or do you find in any of the alleged infringing devices any mechanical equivalent for such energizing connections?

A. I find in the alleged infringement no exact physical devices that are equivalent to the energizing connections for the electro-magnetic gear-controlling means. But I find the mechanical equivalent operating in exactly the same manner in the two pipes DD which connect the controlling cylinder B with the cylinder A with the piston therein.

Q. 323. Can the parts which you have pointed out in your last answer be said to be controlled by the parts which you have heretofore mentioned as being the mechanical equivalent of the said "contact device" mentioned in Claim 2?

A. Yes, sir. They are controlled because the controlling cylinder does control the admission to these parts, the pipes D, of the pressure fluid.

Q. 324. I will ask you to refer to the drawings of the patent in suit and point out what you conceive to be the "controller for said operating means" called for in Claim 3 of the patent in suit?

A. The solenoid 33.

Q. 325. I call your attention to the following places in the patent in suit and ask you if, in your opinion, they are not contradictory of your last answer: line 66 of page 1, "Figure 6 illustrates in detail a part of my controlling device"; line 15 of page 2 "controller-lever 26, pivoted at 26A"; line 26 on page 2 "the springs 27 28 enable the returning rod 25 to exert a pressure on the controller 26 to return it to normal position, while permitting displacement of such controller from normal position under the action of its electro-magnetic operating means. Such means consist of the solenoid 33, * * *"; line 38 of page 2 "the energization of the solenoid being responsive to such speed"; line 52 of page 3 "controller solenoid 33".

A. In the patent in suit the controlling device spoken of in the specification, consisting of a number of parts, are best exhibited in Figure 6, as stated in line 66 on page 1. It must be apparent, however, that the controlling part of the controlling device is the solenoid 33 and its soft iron core 34, because in the specifications of the patent it is repeatedly stated that the controlling device is responsive to changes in speed, to changes in voltage in the electro-motive force in dynamo 8, and there is no part of the device which is at all affected by change of speed of the water wheel except the electric current, in

the winding of solenoid 33 and to its consequent action on its soft iron core 34.

Q. 326. Will you please point out in the alleged infringing device the part or parts which you conceive to be the mechanical equivalents of "a controller for said operating means" called for in said Claim 3?

A. The controller cylinder I have marked B on blue print KKK.

Q. 327. Please point out on the patent in suit what part or parts are meant by the language of Claim 3 of the Lyndon patent, "a returning device for said controller"?

A. Rod 25 upon which are mounted springs 27, 28 and 29, the rod 25 being connected by link 25A to a pin on the movable portion on the disc 22A, which is free to move independent or with the shaft 12.

Q. 328. Please point out in the part or parts of the alleged infringing devices which in your opinion constitute, taken together, the mechanical equivalent of a "returning device for said controller", within the meaning of said Claim 3?

A. The automatically controlled dashpot which I mark as E upon blue print KKK, and the mechanical parts connected therewith, especially the rack which I mark on the same blue print with the letter F.

Q. 329. Can it be properly said that the parts you have pointed out as being the mechanical equivalent of the words "returning device for said controller" within the language of such Claim 3, are provided with "a clutch connection for said operating shaft"?

A. No; not the actual physical clutch connection, but

the mechanical equivalent is therein found as a part of the automatically-controlled returning dashpot, which I have marked E upon the blue print KKK.

Q. 330. What part specifically?

A. That part which I mark with the small letter e, which part serves to accomplish exactly the same result in the returning device as the clutch connection to the operating shaft, as a part of the returning device of the patent in suit, being the disc 22A free to rotate upon shaft 12 except as clutched with its companion disc 23.

Q. 331. Is the part which you have pointed out by small e as the clutch-connection connected to the operating shaft in the same sense that it is in the Lyndon patent in suit?

A. In the effect upon its operation, yes sir; exactly the same.

Q. 332. You mean in its final result and not its immediate connection?

A. Its immediate connection is equivalent. It is not exactly the same in its method. But in both instances, both in the patent in suit and the alleged infringement, there is a direct mechanical connection with the operating shaft.

Q. 333. Where is the part that you consider to be the operating shaft referred to in Claim 3, where it is stated a "clutch-connection to said operating shaft"?

A. The operating shaft is, as I indicated on blue print KKK by the letter F. And that is connected to the clutch which I have indicated by a small e through the piston rod with the automatically-controlled returning

device, this piston rod being marked capital G, the bell crank H, the link I, the lever J and the rod K.

Q. 334. Can the parts that you have pointed out as being the mechanical equivalent of "the returning device for said controller", be appropriately said to be "actuating means controlled by said controlling means" within the meaning of the language of Claim 4 of the patent in suit?

A. Yes, sir.

Q. 335. Please point out in the alleged infringing device the part or parts which in your opinion are the mechanical equivalent of the "actuating means".

A. "Actuating means" are the springs which I mark with the letter L.

Q. 336. Are the parts which you pointed out in answer to the last question controlled by the parts which you have pointed out as "controlling means" within the language of such Claim 4?

A. Yes sir.

Q. 337. Do the parts which you have pointed out as being the mechanical equivalent of the actuating means operate to control the controller to inoperative position so as to prevent excessive movement of the governor?

A. Yes, sir.

Q. 338. What part in the Lyndon drawing do you understand is meant by the circuit controller of Claim 5?

A. The lever arm 26 and the lever arm 43, with various parts and contacts on these two lever arms.

Q. 339. Where is its mechanical equivalent found in the alleged infringing device?

A. It is found in part in the controlling cylinder B, the controller of the Lyndon patent being referred to repeatedly as a combination of a solenoid 33, lever arms 26 and lever arms 43, and so forth, all of which taken together in practical operation are found to be equivalent to the mechanical device.

Q. 340. But could you point out any specific part of the alleged infringing device which you can properly or appropriately call a circuit-controller?

A. No, sir; there is no physical equivalent of the circuit controller on the infringing device.

Q. 341. Could you point out any part or number of parts which are the mechanical equivalent of said circuit-controller?

A. No; I cannot point out any part of the cylinder B with its two connecting pipes D that could be said to be the exact equivalent of the circuit-controller as set forth in the Lyndon patent.

Q. 342. Do you find anywhere in the alleged infringing devices the mechanical equivalent of "a clutch adapted to bring said returning device into operative connection with water-gate-operating shaft" described in Claim 5 of the patent in suit? If so, mention it and point it out specifically in the alleged infringing devices.

A. I find the equivalent in the part which I have marked small e upon the automatically-controlled dash-pot for the purpose of returning the controller to its normal position.

Q. 343. Where, if at all, do you find in the alleged infringing devices the mechanical equivalent of "a mag-

net controlling said clutch'', as mentioned in said Claim 5?

A. I find no equivalent of the magnet alone.

Q. 344. Do you find anything in the alleged infringing device which could be appropriately described as "a circuit for said magnet" as described in Claim 5?

A. No; I can find nothing to be described as a circuit for said magnet.

Q. 345. Referring still to the language of Claim 5 of the Lyndon patent, please point out in the alleged infringing devices the mechanical equivalent of "circuit closers".

A. I find mechanical equivalent to the words "circuit closers".

Q. 346. Where, if at all, do you find the mechanical equivalent of "means actuated by said controller on movement thereof from normal position to engage said clutch with said shaft" within the meaning of Claim 3 of the patent in suit, in said alleged infringing device.

A. I find the equivalent in the automatically-controlled dashpot, which I have marked E in blue print KKK, with its clutch, which I have marked e, and also rack which I have marked F, the combination of which consists of "Means actuated by said controller on movement thereof from normal position to engage said clutch with said shaft", as set forth in Claim 3.

Q. 347. Referring to the line-drawings U and V, or either one of them, please state what the normal position of the auxiliary valve of the auxiliary nozzle is in the device there shown.

Mr. Blakeslee: Objected to as indefinite, vague and incomplete.

A. Well, in neither of the line-drawings U and V is it shown what is necessarily the normal position.

Q. 348. By Mr. Westall: What would you consider the normal position of the valve in the auxiliary nozzle to be?

A. I have had experience with some plants where the normal position would be partly open or fractionally open any amount from entirely open down to what would be practically entirely closed, depending in every case upon the individual plant and its best method of operation under the requirements of the delivery of water below the plant, and so forth. In my experience I know a normal position of the by-pass valve is capable of adjustment and may be anything which the conditions of operation require.

Q. 349. What do you understand is meant by normal position of the by-pass valve in the Lyndon patent in suit?

A. Line 35, page 4, "normally the gate or valve of the by-pass will be half way open so that the amount of water flowing through the by-pass and around the wheel without doing work will be half the amount which the by-pass is capable of carrying".

Q. 350. Is it not a fact that Lyndon shows and describes a device in which the opening and closing movement of the water gate in any appreciable degree will cause a corresponding inverse movement of the by-pass valve?

A. No; not in all instances. To me this is apparent

by lines 88 to 98 on page 4 in which it is stated "it is here to be noted that all water-wheel governors as made today must accomplish their governing only at such a speed as the acceleration or retardation of the water in the column of the pipe can be accomplished, whereas in the case of the governor hereinbefore described, with the compensation-gate and actuating apparatus, the time element is removed from the main gate and the water wheel and taken care of in the by-pass." That indicates clearly to me that if the time element is removed from the main gate and the water wheel, and taken care of in the by-pass, that it does not mean that in every instance the by-pass valve and the water-wheel gate valve shall always be operated inversely; and the operation of the device as disclosed in the Lyndon patent indicates that that may be done. For instance, it is quite possible for controller magnet 33 to actuate magnets 15 and 16 and not actuate any other device whatever. If the controlling magnet 33 is energized and will operate the water gate in either direction through the magnet 15 or 16, then there is absolutely no action whatsoever transmitted to the by-pass itself. So that it is not true that in the Lyndon patent the inverse or the contrariwise operation of the water-gate valve and the by-pass valve are necessary.

Q. 351. Do you consider that the by-pass valve of the Lyndon patent in suit is the mechanical equivalent of the needle nozzle of the alleged infringing device?

A. Yes, sir; because the needle nozzle is well known to be only one type of valve.

Q. 352. Then the needle valve performs the same

function and in the same way as the valve shown in the Lyndon patent?

A. Yes, sir.

Q. 353. If you as a skilled ^{and} engineer were erecting a plant, would you just as soon put in the valves shown in the Lyndon patent as the nozzles of the line-drawing in suit?

A. No; I think not. I think there are conditions when I should prefer to use the needle type of valve, contrasted with the type of valve which is shown in the drawing Figure 1, which indicates a butterfly valve very well adapted for low heads but not well adapted for high heads.

Q. 354. Do you consider that the invention of the Lyndon patent consisted, as set forth in Claim 6, of "means for operating the water gate in either direction" or in the specific means connected to the water-gate-operating means for operating the by-pass valve inversely to the operation of the water gate?

Mr. Blakeslee: Objected to as not calling for the entire invention. It is a fragmentary setting forth and, is therefore, indefinite and incomplete.

A. I do not consider that the Lyndon patent is solely and completely and entirely embraced as set forth in the question.

Q. 355. By Mr. Westall: What do you consider the essence of the Lyndon invention is, very briefly? Or, in other words, what was it that Lyndon added to the art?

A. The essence of the Lyndon invention stated in terms of what Lyndon added to the art, was, I should say, a means of governing for constant speed of water

wheels whereby a variation of the speed would result in a proper change in the water-gate opening. If the required change of the water-gate opening was large enough, Lyndon's invention considered the serious consequences of the inertia of the water in the pipe line, and he provided in addition to a means of controlling the delivery of the water through the water gate to the wheel and by-pass valve so that when conditions required, namely, when there was excessive change of speed requiring a considerable change in the velocity of the water in the pipe line, that water gate valve and the by-pass valve could be and were operated inversely. So, if the water gate opened the by-pass valve closed, and if the water gate closed the by-pass valve opened. And he also provided what is in my mind a matter of very great importance and new in the art, namely, the automatically-controlled return of the governing mechanism so that the governors would not overrun and bump, as we have stated, or, as was commonly termed, the overrunning of the governor and attempting to correct speed in the other direction. But Lyndon found a very great, desirable and actual means, so that the governor mechanism could be returned to its normal position with a sufficient time element so as to prevent any serious stresses in the pipe line.

Q. 356. Do you think the following language correctly describes a construction which would substantially be covered by Claim 6 of the patent in suit: "A governor construction combined with a water gate and by-pass wherein the by-pass and water gate under the con-

trol of the governor are operated inversely each with respect to the other?"

Mr. Blakeslee: Objected to as putting before the witness an arbitrary statement of possible construction not shown to be before the witness, and, therefore, not being one of those things which the witness may be properly examined about in cross-examination, namely, not being one of those things with which the testimony of the witness has dealt in comparing and applying the invention of the patent in suit with the alleged infringing construction. And defendant's counsel is notified that this line of examination tends to constitute an attempt to shape the defense in this suit out of the mouth of a witness for the complainant, and that if the question or any further questions of the same sort is or are persisted in, he will be making the witness his own as to that question, and that any further persistence of this sort will cause us to bring a motion at the proper time to tax against the defendant the cost of taking and returning the cross-examination record of this witness or, at least, such parts thereof as are involved in such inquiry and the responses thereto. And notice of such motion is hereby given. It is to be noted that counsel intentionally is varying from the language of Claim 6, and, therefore, is putting before the witness a supposed variable structure which is not shown to be part of those things entering into the appropriate comparisons by the witness in this cross-examination.

Mr. Westall: Counsel for the defendant simply states that he is simply trying to put in other words the descriptions and expositions of the witness heretofore

given on direct examination.

A. No; that would not be equivalent.

Q. 357. What would you add or subtract to or from the language quoted in the last question to make it an accurate description of the device which you would say contained the mechanical equivalents of Claim 6?

Mr. Blakeslee: The above objection and notice will be considered as repeated to this question and all subsequent questions of this sort.

A. The language does not correctly represent the invention as set forth in Claim 6 or the invention as described in the patent in suit, because the by-pass and water gate are not necessarily operated inversely each with respect to the other, either in the wording of Claim 6 or the patent in suit, because Claim 6 itself uses the words "means connected to the water-gate-operating means and operating the by-pass valve inversely to the operation of the water gate", since it does not follow that means connected to water-gate operating means and operating by-pass valve inversely to the operation of the water gate implies that the by-pass and water gate under the control of the governor are operated inversely, each with respect to the other, the difference being in the use of the word "are" as contrasted with the use of the words "means connected to the water-gate-operating means" since there may be means connected to the water-gate-operating means which may not cause at all times the by-pass and water gate under the control of the governor to operate inversely each with respect to the other.

January 26, 1914, P. M.

By Mr. Blakeslee - at this point
the witness is excused to appear
later for further cross examination

GEORGE J. HENRY, JR., Complainant, heretofore sworn and examined, being recalled for further direct examination, testified as follows in response to questions propounded by Mr. Blakeslee:

DIRECT EXAMINATION.

By Mr. Blakeslee:

Q. 475. Can you now produce a further showing or blue print as requested previously on the record illustrating any installation at either the Division Creek No. 2 power plant or the Cottonwood power plant discussed in your previous examination?

A. I can. I hand you a blue print of such an installation illustrating the apparatus in the installation in the Division Creek No. 2 plant, showing the associated apparatus which I have previously testified to in connection with this plant, and the several parts of which are more clearly shown in the several exhibits already in the case, and which I used in the preparation of this blue print. These exhibits are specifically Complainant's Exhibit V, Complainant's Exhibits H, I, J, K and L, and VV, and said blue print exhibit which I have prepared from these illustrates clearly the several parts of said apparatus in a complete associated assemblage in side elevation.

Q. 476. In what do the differences between this blue print and the showing of Complainant's Exhibit KK and KKK consist, using for the basis of comparison, if you wish, any other exhibits there may be in this case.

A. The means and manner of operation of the several means involving the governor features are identi-

473 15½ insert "January 27, 1914. 1:30 P. M.

Pursuant to adjournment the parties met.

Present:—

Raymond Ives Blakeslee, Esq., solicitor for complainant.

Joseph F. Westall, Esq., solicitor for defendant.

Mr. Blakeslee:—With respect to the notice given the defendant on the record of motions to be presented to the court on Thursday, the 29th of January, 1914, in view of the present interruption of railway transportation rendering it practically impossible to count upon arrival in Los Angeles at the hour stated, even if departure is made from the city of San Francisco upon the 28th of January, after the conclusion of taking testimony in said city of San Francisco as per the adjournment which is about to be noted until tomorrow, the said motions are noticed over from the said 29th of January to the 30th day of January at the same time and place, with full force and effect as if same were repeated in full.

(By consent of parties for both sides tomorrow, Wednesday, January 28, 1914, at the hour of 9:30 A. M.)"

cal. Their physical dimensions and proportions vary, however, from those shown in Exhibit KK, and the setting of the different parts are somewhat different. But the same means are used to accomplish the same results as in Exhibit KK.

Q. 477. And as to any such differences as exist, are they reflected in the photographs of Complainant's Exhibits H to L of the Division Creek No. 2 plant?

A. Yes, sir; the blue print is in accordance with the photographs.

Mr. Blakeslee: We offer in evidence the blue print just described as Complainant's Exhibit LL.

Mr. Westall: Cross-examination is waived.

(The said blue print so offered in evidence is marked by the Special Examiner Complainant's Exhibit LL.)

January 28, 1914, A. M.

C. L. CORY, heretofore sworn, examined and partially cross-examined, being recalled, testified as follows:

CROSS EXAMINATION (resumed)

By Mr. Westall:

Q. 358. What do you understand is meant by the words "normal position" of the water gate, as used in Claim 7 of the patent in suit?

A. I understand by the words "normal position" as quoted from Claim 7, line 70, page 5 of the patent in suit, referring to the water gate, the position of the water gate during normal speed of the wheel under ordinary operating conditions.

Q. 359. Do you understand that "normal position" in line 70 means normal speed?

A. No, sir; I do not understand that it means normal speed. But the entire statement is between commas: "The combination with means for operating the water gate in either direction from normal position," and I understand the words "normal position" is there indicated to correspond to the position of the water gate at normal speed of operating the wheel under any given condition.

Q. 360. And at normal speed what would be the position of the water gate with respect to the complete closing of complete opening?

A. That would depend upon the load being carried by the water wheel.

Q. 361. Would you say that "normal speed" meant completely closed?

A. No, because that would correspond to the water wheel not operating at all.

Q. 362. Would you say that it meant completely open?

A. No; not under operating conditions, because for the normal speed of the wheel regulating the water gate to be entirely open, any increase of the load could not be met by an increased amount of water.

Q. 363. So that normal position under operating circumstances would mean somewhere between complete closing and complete opening?

A. Yes, sir.

Q. 364. It would be in partly open position?

A. Yes, sir.

Q. 365. Now, with the water gate of the Lyndon patent in normal or partly open position, on an increase

of the load carried by the water wheel the water gate is opened still further to compensate for the heavier load. And if the load be decreased, the water gate would move towards closing position. Is that correct?

A. That is correct.

Q. 366. Then when Claim 7 of the Lyndon patent calls for "means for operating the water gate in either direction", it signifies, does it not, means for operating the water gate in both directions?

A. Yes and no. It intends to convey the idea that the water gate may be operated in either the one direction or the other; but it does not mean to convey that necessarily is the water gate operated in both directions. It is true that "either direction" and "both directions" are synonyms of both directions. It is further understood that "both directions" involves the operation either in the one direction or the other or two directions.

Q. 367. But the means shown and described by the Lyndon patent is a means for operating the water gate not only toward opening position but also toward closing position, and vice versa?

A. Yes, sir.

Q. 368. So that the means there disclosed does operate the water gate in both directions?

A. Means there disclosed makes it possible to operate the water gate in both directions, but does not necessarily require the water gate to operate in both directions.

Q. 369. It is a fact, is it not, that the device of the patent would be inoperative as a governing device if it

did not include means for opening^{rat} the water gate in both opening and closing directions?

A. Yes, sir.

Q. 370. So that in that sense, at least, the words "either" in line 70 page 5 of the patent in suit, means "both", does it not, in that particular sense?

A. In that restricted sense of the use of the words "either" and "both", yes sir.

Q. 371. And the same is true, is it not, with the word in line 29 of the patent in suit, in line 41, in line 63, in line 84 and line 103, all on page 5 of the patent in suit?

A. Yes, sir. It being, of course, understood that the use of the word "either" in each of the lines indicated in your question must be understood to convey the idea that there are two directions for motion, these two directions necessarily being understood as possible motions in both directions.

Q. 372. In answer to a previous question you quoted the language of the specifications of the patent in suit beginning at line 35 page 4: "Normally the gate or valve in the by-pass will be half-way open." Is it not a fact that Lyndon shows and describes means for operating this by-pass valve so as to move it both toward more open position than normal and to move it toward more closed position than normal?

A. Yes, sir.

Q. 373. So that among the various devices shown and described by the Lyndon patent in suit are means for both opening and closing the by-pass valve? Is that correct?

A. Yes, sir; using the word "both" in the sense

that it tends to convey the idea that it may be moved either so as to close the by-pass valve or to open the by-pass valve.

Q. 374. Construing then said Claim 7 of the patent in suit in the light of the specifications and drawings of the Lyndon patent, should it not be said that the language of Claim 7 "means * * * adapted to operate the by-pass valve from normal position in either direction" signifies not a choice of directions but signifies means for operating the by-pass valve in both directions?

Mr. Blakeslee: Objected to as an attempt to draw from the witness conclusions based upon indefinite and improper assumptions as to the detailed disclosure and import and meaning of the drawings and specifications of the Lyndon patent in suit and of the previous testimony of the witness.

A. The quotation from Claim 7 beginning with the word "means" on line 70 on page 5 of the patent in suit, and ending with the word "direction" on line 75 of the same page, in my opinion cannot be properly construed as to in any way indicate that "both directions" shall be understood as contrasted with "either direction." And, further, the drawings and specifications of the patent as well as the claims clearly set forth that means are provided not only for operating the water gate in either direction, but similarly means are provided which are connected with the water-gate-operating means for operating the by-pass valve from normal position in either direction, and I do not think that the language of the claim or the language of the specifications of the patent

in suit can be properly interpreted to exclude the idea that the by-pass valve is not to be moved in either one direction or the other as contrasted with the idea that the by-pass valve is moved from normal position in both directions.

Q. 375. By Mr. Westall: As a matter of fact, Mr. Lyndon does show a by-pass valve and means for operating it in both opening and closing directions, does he not?

A. Yes, sir.

Q. 376. Then when you gave the construction which you have to Claim 7, you are considering the language apart from the drawings and descriptions, are you not?

A. No, sir. For this reason: I do not find any place in either the specifications or the claims where the words "both directions" are used. But I find repeatedly in the specifications and the claims the words "either direction."

Q. 377. So that your understanding is that it means simply a choice of directions. Is that correct?

A. Yes, sir. Whichever direction may be desired for the proper operation of the water wheel. And I understand the drawings and specifications to describe an invention whereby, if necessary, the by-pass valve might be moved in only one direction, because specifically the claim and specification says the same may be moved in either direction, which necessarily implies that it is not in both directions.

Q. 378. But is not that expressly stated in the language of the specifications?

A. The language of the specification is clear that means are provided that the by-pass valve as well as the water-gate valve may be moved in either the one direction or the other, which is certainly, under those conditions, that it may be moved in both directions. But the language of the specification certainly is clear that the idea to be understood is that, if necessary or if desirable in the operation of the wheel, we may operate either the water gate only in one direction or we can operate it in the other direction and, similarly, for the satisfactory operation of the water wheel we may, if we choose, so adjust the by-pass valve that it will be operated in only one direction and not operated, if desired, in the other direction. However, means are provided for operating it in either direction or both directions if you find that the movement of the gate-valve and by-pass valve should be for satisfactory operation operated in both directions. I know of many instances in the operation of a plant where the reduction of speed would not be serious, but a sudden increase of speed would be serious, where there is a dead load or constant or uniform load in part, and, in addition to that, a widely varying load. Under such circumstances it would probably be desirable to allow the water gate only to be opened when the variable load was thrown on and prevent the water gate from being closed or moved in the other direction, because we can be certain that the uniform, constant load is there to keep the speed of the wheel constant, independent of the position of the water gate, and, therefore, it is not necessary to close the water gate in connection with the governing of the water wheel beyond a certain

amount. And in my opinion the drawings, specifications and claims of the Lyndon patent are exceedingly clear that the water wheel may be governed by the devices there shown so as to prevent either excessively high speeds only or excessively low speeds only, since means are provided for operating the water gate and by-pass valve in either direction as contrasted with the requirement for means for operating the water gate and by-pass valve in both directions.

Q. 379. How would you reconcile the language of the following lines of the patent in suit with your ideas as to the intended operation of the by-pass valve as described in the claims mentioned in the preceding question, line 28, page 1: "I provide a by-pass * * * and a gate in the said by-pass * * * operating to allow a greater or less flow through the by-pass, according as the water gate is being closed or opened"; line 31, page 4: "Consequently the by-pass valve will be turned toward open or shut position, according to whether the gate is closing or opening"; line 44, page 1: "Means are also provided for arresting the action of the governor when the water-gate is fully opened or closed"; beginning with line 65, page 3: "Suppose that the load in the shaft has been decreased." (Then follows a description of the effects produced by the increased speed of the water wheel, which need not be read * * *) * * * "and the water gate will be closed"; line 40, page 4: "When the governor acts to close the main gate, the compensating device will open more widely the by-pass"; line 48, page 4: "Should the main gate open, a reverse action takes place"; line 74, page 4: "It is obvious that the

by-pass, arranged as described, opening or closing in a manner opposite to that in which the main gate opens or closes * * *"; line 80, page 4: "After the governing takes place the by-pass gate is either open or closed or nearly so". Do they not show that Lyndon in his specifications, at least, clearly contemplated that the water gate and the by-pass valve should automatically open and close?

A. To answer the first part of your question, I find nothing in any of the quotations which you have indicated which in any way is contrary to my interpretation of the words "either direction" as contrasted with the words "both directions". To answer the second part of your question, the quotations as set forth in your question refer to conditions where the variations of speed of the water wheel are to such a degree that the water-gate valve and the by-pass valve are both put into motion. The quotation beginning on line 45 of page 1 refers to conditions when the water-gate is fully open or closed, as specifically stated in line 46, indicating necessarily extreme conditions. In all of the quotations the requirement is stated that a change in load actually does cause a change in the speed of the main water wheel shaft, and the specifications and the drawings and the claims indicate, if this change in speed is sufficient, first that the water-gate will be moved followed by an inverse motion of the by-pass valve. Further, beginning with line 49 of page 2, we find the statement: "The solenoid 33 also serves to control the action of the compensator magnets and returning...magnets through a secondary controlling lever 43," setting forth clearly that the op-

eration of the by-pass valve is secondary to the operation of the water-gate, and the drawings, especially Figure 6 of the patent, show that the contacts 41, 41A and 40 and 40A, which control the water-gate, operate prior to the contacts 45A, 45 and 100 and 101, which operate the by-pass valve; and it is evident from a study of the specifications and claims that means are provided for operating the water-gate and by-pass valve inversely. But the disclosures of the patent also indicate that it is quite possible to have the water-gate alone operated with comparatively small changes in the load without necessarily involving the operation of the by-pass valve.

Q. 380. You say "it is quite possible", intending to indicate, I suppose, that Lyndon nowhere expressly says as much or indicates that the contacts are made to be made successively as you have described. Is that correct?

A. I used the words "quite possible" because a study of the drawings and specifications clearly indicates this fact.

Q. 381. Now, if Lyndon shows a water-gate adapted to be operated in both directions and a by-pass adapted to be operated in both directions, is it not giving the words their usual and ordinary signification to say that when the word "inversely", as used in the claims of the patent in suit in connection with the operation of said water-gate and by-pass valve, that it means that when the water-gate is moved for opening position the by-pass valve is toward closing position, and when the by-pass valve is moved toward closing position the water-gate is moved toward opening position.

A. No, sir. I do not think that is the proper interpretation of the words "means for operating the water-gate in either direction", or "means for operating the by-pass valve inversely with the operation of the water-gate." When you say that the by-pass valve is operated inversely with the water-gate valve, or that the water-gate valve is operated inversely with the by-pass valve, that is a very different things from the disclosures of the patent wherein it is stated, for instance in line 69 of Claim 7 on page 5, "Means for operating the water-gate in either direction from normal position, the by-pass for the water-wheel and a valve for such by-pass, of means connected to the water-gate-operating means and adapted to operate the by-pass valve from normal position in either direction". What I wish to have made clear is that in my opinion there is a decided difference in the two expressions, the first one being that the water gate and the by-pass valve are operated inversely, and the second expression which is that there is a device as set up in the Lyndon patent where a means are provided for operating the water gate in either direction and means connected to the water-gate-operating means, and adapted to operate the by-pass valve from normal position in either direction.

Q. 382. What do you understand is meant by the words "governing action of the water-gate" as used in Claim 7?

A. The governing action of the water-gate is the opening or closing of the water-gate, but not necessarily the opening and closing of the water-gate.

Q. 383. Does it not mean any appreciable move-

ment of the water-gate toward opening or closing position?

A. Yes; that would be a governing action.

Q. 384. Then if governing actions are performed by the water-gate moving in either or both directions, when claim 7 calls for “means * * * * adapted to operate the by-pass valve from normal position in either direction, so as to control such valve inversely to the control of the water-gate during governing action of the water-gate”, “inversely” is to be understood as implying the full closing and opening operations of the water-gate, is it not?

A. It is adapted to both closing of the water-gate as well as to either opening the water-gate or closing the water-gate—either one alone and not necessarily both. Because we find clearly the words in line 72 “of means connected to the water-gate-operating means and adapted to operate the by-pass valve from normal position in either direction.” That is, the means are connected to the water-gate-operating means and adapted to operate or may operate and unquestionably will operate with variations of speed. But “means adapted to operate”, to my mind, does not convey the same idea as that it always is operated.

Q. 385. If the governing movement of the water-gate-operating means may be performed when the water-gate is moved from normal position either toward opening or toward closing position, then the language of Claim 7 reading “means for returning the by-pass valve to normal position on completion

of governing movement of the water-gate-operating means" implies, does it not, that such "means for returning the by-pass valve to normal position" have the function of either further opening or further closing the by-pass valve? Is that correct?

A. That is correct with this distinct understanding: That from Claim 7, beginning with line 78, "means for returning the by-pass to normal position on completion of governing movement of the water-gate-operating means" clearly indicates that the water-gate is absolutely standing still—is not being moved at all,—and at the same time means are provided for returning the by-pass valve to normal position. It clearly indicates that it is not the intention of the patent in suit to restrict the motion of the water-gate valve so that it will always be accompanied by an inverse motion of the by-pass valve, since, in the latter part of Claim 7 it is distinctly stated in line 78 "means for returning the by-pass valve to normal position on completion"—equivalent to the words "after the governing movement of the water-gate-operating means has ceased its operation", meaning in plain words that the water-gate is absolutely standing still, and, at the same time, the by-pass is slowly being closed. That is further set forth again beginning on line 92, page 2: "On the ropes 51 52 are lugs or clamps or stops 65 66, adapted to engage under and lift weights 70 70 when the sheave is turned either way from normal position, these weights being guided in casings 69 on a suitable fixed support. Means may be provided for

easing off the descent of these weights, if desired. For example, the casings 69 may constitute dashpots," clearly indicating that the rapid closing of the by-pass valve may be prevented, this closing of the by-pass valve occurring at a time when the water-gate is absolutely stationary and not being moved at all.

Q. 386. Mention specifically the parts of the alleged infringing device which in your opinion are the mechanical equivalents of "a clutch, adapted to connect said operating device for the by-pass valve with the water-gate-operating shaft," within the meaning of Claim 8 of the patent in suit.

A. I do not find in the alleged infringement the physical clutch adapted to connect said operating device for the by-pass valve with the water-gate-operating shaft. But I do find in the alleged infringing device the mechanical structure which I mark M upon blue print KKK, since the dashpot which I have marked M with its piston and the spiral springs and oil contents, operate in exactly the same manner as clutch 58 57 operates in the patent in suit to transmit the motion which is operating the water-gate valve to the by-pass valve, the motion being transmitted in both instances not rigidly but flexibly, the degree of flexibility being coupled in both instances with adjustment.

Q. 387. What is the function performed by clutch 57 58 in the Lyndon patent in suit?

A. The function of clutch 57 58 in the Lyndon patent in suit is to transmit motion from the water-

gate-operating shaft 20 to the by-pass-operating shaft 49. In the ordinary operation of these two shafts, this motion is not necessarily continuously transmitted but intermittently transmitted.

Q. 388. Does the part that you pointed out as the mechanical equivalent of the clutch perform identically the same function and no more than is performed by the clutch 57 58 of the Lyndon patent in suit?

A. It performs the same function.

Q. 389. Does it perform any further additional function?

A. Yes; it performs the additional function which is performed in the Lyndon device by additional parts such as sheave 54, the ropes thereon, and the lever 50, etc. In other words, clutch 58 57 would not of itself in its operation transmit motion to shaft 49 of the by-pass valve, but requires the additional devices which I have mentioned, while the dashpot which I have marked M on the alleged infringement is complete.

Q. 390. What is the function of the spiral spring in the dashpot to which you have just referred?

A. The function of the spiral spring is to tend to move the by-pass valve to closed position.

Q. 391 Does the clutch 57 58 of the Lyndon patent have any such function?

A. No; not within itself.

Q. 392. Where do you find in the alleged in-

fringing device "the controller" of Claim 8 of the patent in suit?

A. "The controller" is found in line 95 of Claim 8 on page 5 and refers to the equivalent device on the alleged infringement which is lettered B on blue print KKK, this controller being "responsive to the speed of the water-wheel", as stated in line 95, page 5, and Claim 8 of the patent in suit.

Q. 393. Would you say that construed in the light of the Lyndon specifications and drawings the "reversing means for operating the water-gate-operating shaft" called for in Claim 8 signifies that the said reversing means may operate the water-gate in only one direction?

A. As described in the patent, unquestionably the water-gate may be operated in only on direction, although the description in the patent clearly indicates the general operation of the water-gate in both directions, since it is clear that in the reversing clutch gear, consisting of bevel gears 9 and 10, either of which may mesh with bevel gear 11, either of the friction discs 13a or 13b referred to in line 90, page 1, may be so adjusted as to not engage if in the operation of the water wheel such lack of operation of either 13a or 13b may be desirable.

Q. 394. In the "controller" of Claim 8 of the patent in suit, as described in said claim as controlling said reversing means, do you understand its signification to mean that said controller controls the said reversing means in only one direction?

A. No; as far as it is concerned it controls the

reversing means in both directions. But, as I said before, the adjustment of the friction discs 13a and 13b in connection with the lever 13 may be so adjusted as to not transmit the rotation of shaft 6 even though the controller, as far as its operation is concerned, would tend to do so.

Q. 395. Please point out in the Lyndon drawings the "means operated by said controller to bring the aforesaid clutch into operation and to release said clutch when the governing action is affected" as called for in Claim 8 of the patent in suit.

A. Referring to Claim 8, line 97, page 5, "means operated by said controller to bring the aforesaid clutch into operation" in the Lyndon patent includes electro-magnets 15 and 16, either one of which will operate upon armature 17 and connect either bevel gear 11 to bevel gear 9 or 10, depending upon which electro-magnet is actuated by the controller. Further referring to Claim 8 beginning with line 99, "and to release said clutch when the governing action is effected", includes, as set forth in Figure 1 of the Lyndon patent in suit, the lever arm 26 carrying contacts 40, 40A and 41, 41A, and the opening of either of these contacts releasing the clutch when the governor action is effected.

Q. 396. Please now indicate where, if at all, in the alleged infringing devices you find the mechanical equivalents of "means operated by said controller to bring the aforesaid clutch into operation and to release said clutch when the governing action is effected", within the meaning of said Claim 8.

A. I find in the alleged infringement the means operated by said controller to bring the aforesaid clutch into operation, the two pipes DD leading from the two ends of the controller cylinder B, the equivalent of the clutch being the cylinder within which there is the piston A, which is operated in either direction in the same way as the clutch in the Lyndon patent. And, further, to release said clutch when the governing action is effected the double pistons in the controller cylinder B move to such a position as to cut off the flow of the pressure fluid from the controller to the cylinder in which there is the piston A, capable of being moved in either direction in the same way as the reversing clutch of the Lyndon patent.

Q. 397. Are the mechanical equivalents of "the means" you have pointed out in answer to the last question "operated" by the parts you have pointed out as the mechanical equivalent of the "controller" within the meaning of said Claim 8?

A. Yes, sir.

Q. 398. What is the function performed by the cylinder with its piston A in the alleged infringing device?

A. It is to transmit motion in either direction to the water-gate-operating shaft F.

Q. 399. What part or parts do you understand are meant by the "clutch" mentioned in Claim 8 of the Lyndon patent in suit?

A. I understand the clutch mentioned in Claim 8

to refer to bevel gears 9, 10, bevel gear 11 and sleeve 13, and friction discs 13a and 13b.

Q. 400. Where, if at all, do you find the mechanical equivalent of said clutch within the meaning of Claim 8, in the alleged infringing device?

A. I find the mechanical equivalent in the cylinder with its piston A as marked on blue print KKK. That is the equivalent of the reversing clutch in the Lyndon patent.

Q. 401. Is the part which you have pointed out as the mechanical equivalent of the "clutch" of Claim 8 brought into operation and released by the parts you have pointed out as the mechanical equivalents of "means operated by said controller" mentioned in said Claim 8, within the meaning of said claim?

A. Yes, sir.

Q. 402. When Claim 9 of the Lyndon patent calls for "means for returning the valve to normal position", said language is to be understood, is it not, as signifying that if the valve has been opened to a position wider than normal, such means will operate to move it toward closing position; and if the valve has been closed to a position less than normal, said means will operate to move it toward opening position. Is that correct?

A. I do not think it is right to say that it will move to operating it. The means is adapted to operate it in the directions that you have indicated. But that the means will absolutely operate it in the direction indicated does not necessarily fol-

low when the words of the Claim are "means adapted to operate it", and provided with "means to return the valve to normal position".

Q. 403. Just how much and what parts of the alleged infringing mechanism do you consider as being the mechanical equivalents of the "dynamo" of Claim 9?

A. Practically the fly-balls and their component parts, of what is commonly known as the fly-ball governor. By that I do not mean the governor in the sense that we have used the water-wheel governor, but the fly-balls so arranged that they will be thrown out with increased speed and will recede with decrease of speed.

Q. 404. Just what parts would you include as the component parts spoken of in your last answer?

A. I would include the fly-balls themselves and their connections on the bottom and the top collars of the fly-ball governor.

Q. 405. Please point out specifically the parts in the alleged infringing device which in your opinion ~~are the mechanical equivalents~~ ^{are the mechanical equivalents} of the controller as mentioned of Claim 9.

A. I understand the mechanical equivalent in the alleged infringement of the controller as mentioned in Claim 9 on lines 115 and 116 to be the controller cylinder B.

Q. 406. The parts which you have pointed out as the mechanical equivalents of the controller, can they be said to be "operated" by the parts which you

have pointed out as the mechanical equivalents of the electro-magnetic device?

A. Yes, sir; since in both cases, namely, in the Lyndon patent and in the alleged infringement, the controller is operated by a variation of speed. In the Lyndon patent it is due to a change in the electro-motive force of the dynamo, and in the alleged infringement it is due to a change in position of the fly-balls designated by C in the blue print KKK.

Q. 407. What do you consider the mechanical equivalent in the said infringing device of the electro-magnetic device mentioned in lines 115 and 116 of Claim 9 of the patent in suit?

A. I understand the mechanical equivalent to be the controller cylinder B.

Q. 408. And what do you understand to be the mechanical equivalent of the controller?

A. The same. The controlling cylinder B.

Q. 409. So the electro-magnetic device and the controller are one and the same thing?

A. They are part of the same general controlling device whereby variations of speed cause certain results.

Q. 410. Then it would lead to the conclusion, would it not, to say that the part which you have pointed out as the mechanical equivalent of said controller within the meaning of Claim 9, that it is operated by the mechanical equivalent of what you pointed out as the "electro-magnetic device" of Claim 9?

A. Yes, sir. Probably it might avoid confusion to say that the pipes DD in the one correspond to the

electro-magnetic device in the other, because the object of the electro-magnetic device in the Lyndon patent is to respond to the operation of the controller in affecting the reversing clutch, and so in the mechanical equivalent of the alleged infringement, as set forth in blue print KKK, the two pipes D have the pressure fluid admitted to either the one or the other of them, tending to operate the piston A within its cylinder due to the operation of the controlling cylinder B.

Q. 411. Please point out in the infringing device the mechanical equivalent of the "clutch for the by-pass-operating means" of Claim 9 of the patent in suit.

A. "Clutch for the by-pass-operating means" in line 120 of page 5, Claim 9, evidently refers, since the word "aforesaid" immediately precedes the word "clutch", to the clutch as found in line 109 of page 5 in Claim 9,—“a clutch, adapted to connect such operating means with the water-gate-operating shaft”, So that the clutch referred to corresponds with the dashpot marked M on blue print KKK, being the equivalent of clutch 58 57, Figure 1 of the patent in suit, and the device is connected therewith for operating the by-pass valve 49.

Q. 412. Do you find in the alleged infringing devices the mechanical equivalent "a circuit for said magnet" as called for in Claim 9 of the patent in suit? If so, please point out and indicate.

A. I do not find the physical equivalent of the circuit for said magnet. The circuit normally re-

ferred to in said claim being to an electrical conductor for the purpose of carrying electricity.

Q. 413. Where, if at all, in the alleged infringing devices do you find the mechanical equivalent of "means * * * to close such circuits", as called for in Claim 9 of the patent in suit?

A. I find no such physical equivalent as described by those words in the alleged infringement.

Q. 414. The controller shown and described in the Lyndon patent operates in two directions, does it not?

A. Yes, sir.

Q. 415. Do the parts which you have pointed out as the mechanical equivalent operate in two directions?

A. Yes, sir.

Q. 416. Can it be said that the parts that you have pointed out as the mechanical equivalents of said "controller" operate when moving in either direction to close the parts which you have pointed out as being the mechanical equivalent of the circuit mentioned in Claim 9 of the patent in suit?

A. Yes, sir.

Q. 417. Which parts have you pointed out as being the mechanical equivalent of the circuit?

A. I have not pointed out any particular parts as the equivalent of said circuit, as I said I did not find the equivalent of such circuit.

Q. 418. Then it would follow, would it not, that the parts which you have pointed out as the mechanical equivalent of the controller do not operate

to close any parts corresponding to a circuit, because you have been unable to find any such circuit?

A. I said that I did not find the physical equivalent of the circuit. But I do find the mechanical equivalent of the circuit as far as the opening and closing of the circuit in the controlling cylinder marked B on blue print KKK. If you choose, you can assume that opening and closing the circuit of the Lyndon patent would correspond to the opening and closing either the one or the other outlet valve through which the pressure fluid flows from the controller cylinder B shown on the blue print KKK.

Q. 419. Would you consider the outlet valves as the equivalent of the electrical circuit?

A. It would not be the equivalent to the circuit, but it would be the equivalent to the contacts and the pipes D, the mechanical equivalent of the electrical circuits.

Q. 420. Now, in pointing out what you have conceived to be the mechanical equivalents of the various elements mentioned in the claims of the Lyndon patent in suit, have you given any weight to the fact that Lyndon in the first paragraph of the specifications states that he has invented a new and useful improvement in "electro-mechanical water-wheel governors" and in which he refers to the succeeding paragraph as a specification of his new and useful improvements in a certain kind, namely, "electro-mechanical water-wheel governors?"

A. Yes, sir. Since in the Lyndon patent the specifications set forth the electrical means and electrical

contacts and electrical circuits to accomplish certain mechanical motions in the proper sequence, and certainly the mechanical equivalents of the alleged infringement would not in any way vitiate that, since not only in the alleged infringements but in the patent in suit the only thing that will accomplish the proper governing of the water-wheel is mechanical motion transmitted and imparted to the water-wheel gate, and, if desirable, also the by-pass valve. The means for obtaining the required mechanical motion in the Lyndon patent from the controller is by the use of electrical circuits and electrical currents, while in the alleged infringement the means employed for transmitting the mechanical motion to the water-wheel gate and the by-pass valve is by means of mechanical motion, the result in both instances being the same.

Q. 421. How would you define the term "mechanical equivalent"?

A. I should say that one device was the mechanical equivalent of another if in both devices the mechanical operation of the desired part or desired parts was accomplished the same with both devices.

Q. 422. Do you mean by that that when the same result flows from the use of the two separate devices?

A. The same result is accomplished by the two distinct devices.

Q. 423. Is it your opinion that the claims of the patent in suit are entitled to the same range of mechanical equivalence with the word "electro-me-

chanical" omitted from the title and the first paragraph of the specifications as with said term included?

Mr. Blakeslee: Objected to as calling for more than expert testimony. In fact it is calling for a legal conclusion and is attempting to get from the witness a definite and arbitrary application of the law of mechanical equivalence, irrespective of the specific counts of mechanical equivalence. As to the application of the law of mechanical equivalence, as we have before stated on the record, it is the province of the court to apply this law based upon the mechanical equivalents as found by the witnesses. In other words, to apply such law to the testimony of the witnesses in each particular instance in which such equivalence is traced.

A. I do not consider myself qualified to answer that question at all, because I am not at all familiar with the interpretation of such equivalence in patents as granted and issued from the United States patent office.

Q. 424. By Mr. Westall: Has what you understand to be the essence or principle or invention of the Lyndon patent gone into extensive use?

A. Yes; it has gone into extensive use.

Q. 425. How extensively?

A. Practically essential to the operation of a very great many water power developments, especially where that water power is used for the generation and ultimate transmission and distribution of electrical energy.

Q. 426. Have you sufficient knowledge to say approximately how many plants in this country have utilized that principle or invention?

Mr. Blakeslee: Objected to as not cross-examination unless the witness is asked to state of his own knowledge as to the number of such plants.

A. I could not state accurately of my own knowledge the number of such plants, but I can say of my own knowledge that the plants with which I am personally familiar, especially upon the Pacific Coast from Alaska to New Mexico and as far east as Denver, that the fundamental principle set forth in the Lyndon patent is in use in plants the aggregate power of which is not less than 100,000 to 150,000 horse power—probably not less than fifty such plants.

Q. 427. By Mr. Westall: With the disclosures, of the Lyndon patent before the public for approximately eleven years, have you ever known in all your engineering experience of a single electro-mechanical governor constructed and installed or practically used for the purpose of accomplishing the results of water-wheel regulation made out by Lyndon, constructed in exact accordance with the drawings and the specifications of the Lyndon patent in suit.

A. No; I know of none constructed in exact accordance with the details set forth by Lyndon.

Q. 428. Have you known of any employing the same number of magnets and solenoids and the same general arrangement of springs, circuits and dynamos?

A. Yes, sir; I have known of some that were used practically—perhaps not operating the same number—but operating upon the same general electro-mechanical principles.

Q. 429. Where have you known of these devices being used?

A. At various plants on the Pacific Coast, notably the Folsom Power Company on the American River near Sacramento, the San Joaquin Power Company, the Utah Light & Power Company, and the Telluride Power Company in Utah and Colorado.

Q. 430. Did they have this dynamo described by Lyndon?

A. They had the essential characteristics of the dynamo.

Q. 431. They did have a dynamo for the same purpose and in the same position?

Mr. Blakeslee: Objected to as indefinite as to what dynamo is being discussed.

A. I don't know.

Q. 432. By Mr. Westall: Did they have a solenoid corresponding to the solenoid 33 and close the circuits in the same general position?

A. They had solenoids and circuits, but I don't know and, in fact, I don't believe they operated in the same detail as set forth in the Lyndon patent, but they were known as electrical governors.

Q. 433. So that I understand that there were in operation certain devices known as electrical governors, but you do not know of any that were constructed with the same number of magnets and the

same arrangement of circuits as Lyndon discloses?

Mr. Blakeslee: Objected to as calling for a mere repetition of the testimony already given by this witness.

A. No.

Q. 434. By Mr. Westall: So that you have never had an opportunity of seeing the actual operations of the device constructed in accordance with the Lyndon drawings?

A. No, sir; I never have.

Q. 435. Which would you consider the cheapest form of installation, a device constructed in accordance with the Lyndon drawings or one in accordance with the alleged infringing devices as shown in the evidence?

A. I don't believe I can express an opinion as to which would be the cheaper.

Q. 436. As an engineer if you had charge of the installation of a water-wheel for substantially the same purpose and in the same position as that described as being on the line of the Los Angeles aqueduct, and you had your choice of an electro-mechanical governor constructed exactly or in substantial accordance with the description and drawings of the Lyndon patent in suit and one as shown and described in the alleged infringing devices, which would you choose?

A. I think from my knowledge of the successful water-wheel governing mechanism I should prefer to use the mechanical device as compared with any proven electro-mechanical governing device.

Q. 437. I am not speaking of electro-magnetic governors generally, but the specific one shown and described by Lyndon.

A. I think I should prefer to use the thoroughly satisfactorily operated mechanical devices rather than the device in strict accordance with the specifications of Lyndon, although I am absolutely convinced that the Lyndon device, as disclosed in the patent, could be made to operate and fulfill every requirement as set forth in the patent itself and as practical operation demands.

Q. 438. You have testified as to certain sequences of electrical energization. Is it not a fact, in your opinion, that unless the means to accomplish these successful energizations is read into the claims in the Lyndon patent the device would be inoperative?

A. No, sir; it would be thoroughly operative.

Q. 439. Would it be operative if instead of contacts being made successively they were made at the same time?

A. I don't think the device would work if all those contacts would be made absolutely at the same time, and I don't think the specifications and drawings of the Lyndon patent indicate for them to operate to open or close at the same time exactly. There is certainly nothing in the patent which indicates that it is the intention to have them all open or close at the same time. For instance, it is clear that 40 and 40a, or 41 and 41a, remain closed during many openings and closings of contacts 45a and 45,

and 101 and 103, and so on. The description of the patent indicates that very clearly.

Q. 440. Where does Lyndon say in the patent in suit that any of the contacts should be mercury contacts?

A. There is no statement in words to that effect, but Figure 6 shows contacts 40 and 40a, 41 and 41a, and 45a and 45, and by the drawing it clearly indicates that they are mercury contacts.

Q. 441. The drawing referred to does not show, however, that such mercury contacts are to be placed at contacts 103 and 104 of the Lyndon patent?

A. No, sir; contacts 103 and 104 are not shown in Figure 6 of the Lyndon patent.

Q. 442. So that mercury contacts at those points would have to be supplied by the one building or installing the device?

A. I think all contacts would have to be so supplied.

Q. 443. By "being ^{su}applied", of course, I mean to be chosen in preference to other contacts. Is that not true?

A. Yes, sir; the mechanical construction and operation of any device as contrasted with the drawings and specifications of the patent, in my experience, are always so developed.

Q. 444. Is it your understanding that when contact is made either at 40a or 41a that there is to be a contact at 45?

A. Not necessarily at the same instant.

Q. 445. How would a contact be prevented at the same time?

A. Simply by adjusting the contact 45a or the amount of mercury in the contact 45, so that either contacts 41 and 41a or contacts 40 and 40a might be completely made without necessarily closing contact 45a and 45, since contacts 45a and 45 are operated by the lever arm 43 while contacts 41 and 41a and 40 and 40a—

Q. 446. The length of the contact points and the height of the mercury in the cup does not indicate in this drawing Figure 6 in the Lyndon patent that there is to be any difference in the time when the contact is to be made, as has been attempted to be shown in the blue prints which you have referred to on your direct examination?

A. No; the drawings are so small that it would require a good deal of imagination to say that the drawings indicate any difference in those contacts—I mean the drawing of Figure 6 of the patent in suit.

Q. 447. The patent nowhere states that the contacts at 45a, 46a, 100 and 101 would not be made simultaneously, does it?

A. No; I do not think there are any definite statements made to that effect, but it is apparent in studying the patent that if the conditions exist so that neither contacts 41 and 41a or 40 and 40a are closed. You can close all the contacts you want and you would get absolutely no results, since contacts 41 and 41a, and 40 and 40a are contacts which

through certain devices place in rotation the shaft operating the water-wheel gate. And if neither of those are closed it does not make any difference what happens to all the rest of the contacts. The governing mechanism is then inoperative. It would indicate to me that it was the intention to first either close 41 and 41a or 40 and 40a, depending on the manner in which the speed was to be changed, and then have the subsequent contacts made as required in the operation of the governing mechanism.

Q. 448. Is this not a fact: that at line 59, page 2, of the specifications of the patent in suit, reading: “* * * so that when the lever 26 and the rod 35 move in either direction the lever 43 will be moved in one given direction. In such movement of the lever 43 contacts 45a, 46a, 100, 101, carried thereby, will connect with fixed contacts 45, 46, 103 and 104 to close the circuit of the returning magnet and the compensator-magnet, respectively” Lyndon indicates clearly that said contacts are to be simultaneous?

A. No; I do not think that is a proper conclusion from the language there used.

Q. 449. If Lyndon did mean that, it is a fact, is it not, that the Lyndon patent would not effectuate the results aimed at by Lyndon?

Mr. Blakeslee: This appears to us to produce a condition of negative pregnant. We do not think the question calls for any intelligible answer in that it attempts to set up a meaning for the patent and then knock it down.

A. I can only answer that in this way: that if Lyndon had an idea in this patent that when he closed one set of contacts he closed all the contacts simultaneously, and kept them all closed, no contact being open till they were all open, none closed till they were all closed, he certainly could not effect the thing which he specifically sets forth that he desires to accomplish by the patent.

Q. 450. By Mr. Westall: If, therefore, the language which I have quoted in the preceding question from line 59, page 2, is to be accepted literally and the circuits controlled by the contacts 45a, 46a, 100 and 101, are to be made simultaneously, then the Lyndon patent does not describe an operative device? Is that not true?

Mr. Blakeslee: Objected to as not correctly following the answer to the previous question.

A. I cannot interpret what you have in mind by using the word "literally". But, beginning with line 62, "in such movement of the lever 43 contacts 45a, 46a, 100 and 101, carried thereby, will connect with fixed contacts 45, 46, 103 and 104 to close the circuit of the returning magnet and the compensator-magnet, respectively", if that can be so narrowly interpreted as to mean that those two sets of contacts are always made at the same instant and broken at the same instant, then I think the particular device would not work very satisfactorily.

Q. 451. By Mr. Westall: Would it work at all and produce the results of regulation of the water-gate and by-pass valve?

A. Yes, it would work at all, but as is always the case with such contacts as described in the patent, there are, in my experience of a great many years, adjusted so as to accomplish the desired results. I know of no electrical contacts that are not subject to such adjustment in the operation of any device through electrical circuits being opened or closed.

Q. 452. Is there anything new with Lyndon in the use of solenoids and magnets to actuate lever arms or to throw into or out of operation clutches?

A. No, sir; I do not think so.

Q. 453. So there is nothing broadly new, you say, in the specific means employed by Lyndon as disclosed by the patent in suit to effectuate the inverse operation of the by-pass valve and the water-gate? Is that correct?

Mr. Blakeslee: Objected to as indefinite and vague.

A. I do not think there is anything new in the electrical means, but I think the ultimate result is certainly something decidedly new, and certainly the ultimate result whereby mechanical motion is transmitted to the water-gate and to the by-pass valve so that they are mutually operated, sometimes inversely and at other times operated so that when the water-gate is absolutely still and not in motion at all the by-pass valve is slowly being returned to whatever position is being desired, is new.

Q. ~~5454~~ By Mr. Westall: So that the novelty of the Lyndon patent in suit, if any, would consist in

the results rather than in any specific form of means to effectuate those results.

A. I should say that is correct.

Q. 455. On page 35, line 3, of the typewritten record of this case, counsel for complainant has used the following language as descriptive of the devices which he evidently considers an infringement of the claims or some of the claims of the patent in suit: "A governor, a water-gate, a by-pass, a means whereby the water-gate and by-pass are inversely operated under the control of the governor." Would you say that a device which could be appropriately so described would embody the mechanical equivalents of the combination of the elements mentioned in any of the claims of the patent in suit?

A. Yes, sir.

Q. 456. Which claims particularly could you point out?

Mr. Blakeslee: Both the preceding question and the last answer are objected to, particularly with the intimation that complainant's counsel has thought that the subject matter therein constitute an infringement of the patent in suit. If the record shows any proof that such subject matter is contended to be an infringement of the patent in suit, let such parts of the record be considered. The part of the record referred to does not so state and was not in the words of the witness and was not in the nature of a stipulation. Counsel is manifestly trying to borrow such language and to utter it from his own mouth as an arbitrary word-structure which he is

attempting to get the present witness to compare with the patent in suit. Unless counsel can show such language to have been used by the witness in defining structures alleged to infringe the patent in suit, he is notified that he is going beyond cross-examination and is making the witness his own, and the notice and motion previously given and made with respect to such purported cross-examination is hereby repeated with reference to the entire line of attempted cross-examination of this nature.

A. Claims 6, 7 and 8.

Q. 457. By Mr. Westall: The drawings of the Lyndon patent indicate, do they not, that the water-wheel is in horizontal position rather than vertical?

A. It would seem that the water-wheel is vertical, if it is contained within the cylinder 2 of Figure 1.

Q. 458. Would not the shape of the pipe at Figure 2 and the emergence of the shaft from the top of that cylindrical pipe 2 indicate very clearly that a horizontal water-wheel was intended to be used in that structure?

A. No; I do not think so. I think it would rather clearly indicate that it was a vertical water-wheel. Shaft 3 is vertical as shown in Figure 1.

Q. 459. How, then, do you understand the shaft 3 to be connected to the water-wheel in the structure shown in Figure 1 of the patent in suit?

A. Figure 3 is the water-wheel shaft. Line 71, page 1, 3 is the main shaft connected at one end to the water-wheel.

Q. 460. That shaft is shown in vertical position, is it not?

A. Yes, sir.

Q. 461. If that is the case, could the water-wheel possibly be in vertical position?

A. The shaft is connected to the water-wheel and common engineering practice is generally understood to mean that if the main shaft is vertical the wheel itself will be vertical.

Q. 462. By Mr. Blakeslee: Do you mean the plane of rotation?

Mr. Westall: Yes, sir.

Mr. Blakeslee: Then you don't understand each other.

A. If your question implies what is the plane of rotation of the water-wheel, I would understand Figure 1 as showing a water-wheel with the plane of rotation horizontal, transmitting power to a vertical shaft 3 in Figure 1.

Q. 463. By Mr. Westall: The water-wheel of the alleged infringing device is not a water-wheel revolving in a horizontal plane, is it?

A. As far as I could interpret the photographic exhibits in this case, no sir. The water-wheel is revolving in a vertical plane, but the main shaft is horizontal.

Q. 464. Is it not a fact that would be impossible to place the water-wheels in the alleged infringing devices in a position so as to revolve in a horizontal plane without vital changes in the structure of the

device as would clearly avoid a change of mechanical equivalence?

A. I do not think it would be impossible to place them so that the plane of rotation would be horizontal. There would be certain changes, but I do not believe those changes would be what you have evidently in mind, if you term them vital changes.

Q. 465. How would you change the construction shown in the alleged infringing devices so as to have it revolve in horizontal plane?

A. I would simply make a modification so that the main water-wheel shaft ran vertically instead of horizontally. The plane of rotation of the water-wheel would be horizontal instead of vertical. And other details in conformity therewith.

Q. 466. How would you arrange the main nozzle and the by-pass nozzle?

A. Simply rotate them through 90 degrees and have them operate so that the main nozzle would operate on the wheels rotating in a horizontal plane, and the by-pass valve so that the water from the by-pass would not strike the buckets of the wheel at all. It would be merely a modification in the design of the alleged infringing devices so that we could use what are known as water-wheels of the vertical type as contrasted with those used of a horizontal type.

Q. 467. And you believe that if that change were made the device would not be vitally different in its principle of operation from the construction shown in the blue print before you at the present time?

A. No, sir. In fact, I personally know of water-wheels having been so governed and by "so governed" I mean by devices practically the equivalent of the alleged infringement, and applying to both vertical water-wheels and horizontal water-wheels.

Q. 468. Do you consider the exact placing of a water-wheel as affecting the question of equivalence in any degree?

A. No, sir. That is, by your use of the words "placing the water-wheel", whether the water-wheel is a so-called vertical type or a so-called horizontal type.

Q. 469. Suppose that the water-wheel as indicated on line-drawing Complainant's Exhibit U were moved so that it occupied the position substantially of that marked in a red dotted line which I have just placed on said Exhibit U: Would that in your opinion affect the application of the doctrine of mechanical equivalence in any way?

Mr. Blakeslee: Objected to as not cross-examination and as assuming an arbitrary arrangement not put before the witness in the direct examination, and as indefinite and vague.

A. No, sir; because all that would be necessary in the operation of your governor would be to rotate the whole mechanism about the center of the shaft of the water-gate or needle valve—rotate it through 180 degrees, and you have the exact equivalent.

Q. 470. By Mr. Westall: I am assuming in placing the dotted line on the drawing that the plane of the rotation of the water-wheel will be the same

as indicated, and that no other change will be made in the device as shown by that drawing.

A. In that case all that would be necessary would be to move the governor mechanism so that it would occupy a position on the sheet lower down on the sheet or nearer the bottom, so that the water-gate or needle valve would impinge on the appropriate point on the circumference of the wheel.

Q. 471. But my question is, without changing the relative positions of the dotted water-wheel and the main valve and by-pass valve.

Mr. Blakeslee: The same objection.

A. If you have a water-wheel in the general position of the dotted red line, you would have an absolutely inoperative mechanism, because you have not assembled your water-wheel and your water-gate valve properly. It is evident that if you have a water-wheel so that the nozzle would strike the buckets and then you move the water-wheel and do not move the nozzle, you get an inoperative condition. But you certainly have not changed the equivalence of any of the mechanical parts whatsoever.

Q. 472. Do you think that the water projected from the by-pass valve in the construction which I have indicated in the last preceding questions would interfere with the rotation of the water-wheel if the main nozzle were directed against the buckets in the same general position as indicated by the red dotted line?

Mr. Blakeslee: The same objection is noted, and

this line of questions is particularly objected to as confusing, and not cross-examination, inasmuch as counsel has manifestly attempted to bring the wheel in a position with relation to the by-pass which is not pointed out by him except by the irregularly plotted dotted red line.

A. Certainly the water of the by-pass valve would interfere, inasmuch as the water of the by-pass valve would hit the buckets on the wheel.

Q. 473. By Mr. Westall: Would it prevent the rotation of the wheel necessarily?

A. It would not necessarily prevent the rotation of the wheel, but you would have water delivered by the main water-gate valve tending to move the wheel in one direction, and water delivered by the by-pass valve tending to move the wheel in another direction.

Q. 474. But such a construction, as I understand you, would not affect the mechanical equivalence of the parts which you have heretofore pointed out.

A. It would not affect the mechanical equivalence of the parts, but it would be an absurd arrangement of the governor mechanism in relation to the position of the water-wheel and would be inoperative. But it would not affect in any way the mechanical equivalence of the various parts.

Mr. Westall: I believe that is all.

REDIRECT EXAMINATION

By Mr. Blakeslee:

Q. 475. In other words, as I understand your answer to the last question put in cross-examination, the governing device of the Lyndon patent as portrayed in part in Complainant's Exhibit U would be varied in its several aspects if desirability and efficiency, without totally interfering with the operation of the water-wheel? Is that correct?

A. Yes, sir; I should say, in order to make my understanding clear, that such relation of the water-wheel and the governing mechanism would be just as sensible as for a man to put his hat on his feet and his shoes on his head.

Q. 476. In that connection, would the by-pass really be a by-pass?

A. No, sir; it would simply be an extra nozzle working on the wheel adversely to the main nozzle.

Q. 477. Now, as to the mechanical equivalence between the various devices of the alleged infringing devices in the photographs and drawings and blue prints in evidence, and the specific features of construction and combination of parts disclosed in the Lyndon patent in suit, do you not find in the Lyndon patent in suit mechanical features as well as electrical features?

A. I do.

Q. 478. Point out some of them briefly in the Lyndon patent in suit, Figure 1.

Mr. Westall: We admit that there are mechani-

cal features as well as electrical features in the Lyndon patent.

Q. 479. By Mr. Blakeslee: And whenever you have an electrically-controlled feature or a part, the movement of which is electrically controlled, does not a mechanical action take place after such electrical or electro-magnetic control?

A. In every instance; yes, sir.

Q. 480. For instance, referring to the armature 17 of the electro-magnets 15 and 16, when each of such magnets is energized is not such armature and the lever 103 moved, and do they not execute a mechanical action?

A. They do; yes, sir.

Q. 481. Therefore, how would you briefly describe the transmission through the agency of an electrical path such as that through the circuit including the wires 106, with respect to the action of the rigid element, if the latter were substituted for such electrical path, to move the armature 17?

A. Exactly the same result in the two instances, the means in the one case being an electrical circuit with the current flowing therein, and the other being an actually mechanical transmission of the motion.

Q. 482. And after in each instance such electrical circuit performs its function, does not a mechanical action follow pursuant thereto?

A. Absolutely, in every instance, yes sir.

Q. 483. Then, if I understand your testimony correctly, Lyndon simply employs an electrical impulse in substitution for the push and pull or twist

of the mechanical form, such, for instance, as the various levers, arms, spindles, stems, cranks and the like, of the alleged infringing devices as shown in Complainant's Exhibit KKK.

A. Yes, sir; that is true.

Q. 484. Now, coming down to the relation between the controller and the electro-magnetic device, you have described the controller as consisting of a number of parts responsive to the actuation of the electro-magnetic device and the movement of the core 34 within the solenoid 33. Treating the solenoid 33 as an electro-magnetic device, which part governs the action of the other—the electro-magnetic device or the various parts connected up with the core 34?

A. The core 34 is given mechanical motion as the result of the electrical current coming in 33, and the object of the electrical devices is, in effect, to transmit electrically the mechanical motion of core 34 through armature 17 to the bevel gear 11, etc. The mechanical motions being the results in every instance.

Q. 485. Which of the several features in my last question is more essential, the controller or prime mover?

A. Electro-magnet 33.

Q. 486. And that corresponds more particularly with what part of the alleged infringing devices in Complainant's Exhibit KKK?

A. The controller cylinder B.

Q. 487. Now, in your cross-examination, you

referred to the part M in Exhibit KKK as a clutch controlling the by-pass, and you also refer to the control of such by-pass through the parts B and A. Which do you wish to consider more particularly as the clutch in correspondence with the clutch referred to in Claim 8?

A. The only use of the word "clutch" in Claim 8 is in line 89: "A clutch, adapted to connect said operating device for the by-pass valve with the water-gate-operating shaft", which refers to clutch 57 58 of Figure 1.

Q. 488. Now, what part of the alleged infringing device in Exhibit KKK is the mechanical equivalent of that clutch?

A. Dashpot M.

Q. 489. And what electro-magnets control the clutch 57 58 in the Lyndon patent in suit?

A. Electro-magnet 64.

Q. 490. And what contacts control the energization of that electro-magnet?

A. Contacts 103 and 104.

Q. 491. Then when you refer to electro-magnets 15 and 16 as controlling the clutch, what clutch do you wish us to understand is controlled by those electro-magnets?

A. The reversing clutch, consisting of the bevel gears 9, 10, 11.

Q. 492. And not, I take it from your last testimony, the clutch 57 58?

A. No, sir. I do not remember of ever having referred to electro-magnets 15 and 16 having any-

thing whatsoever to do directly with the operation of the clutch 57 58.

Q. 493. But only directly, I take it, with the operation of the by-pass through the power imparted by shaft 20; is that correct?

A. That is correct.

Q. 494. Now, as to the sequence of energization of the several electro-magnets 15 or 16, 32 and 64, and conversely the sequence of de-energization thereof within the meaning of the Lyndon patent in suit, do you take it that the use of the word "either" in Claims 6, 7, 8 and 9, for instance, has a bearing upon such claims and the regulation, if necessary, of the several contacts controlling the energization of said electro-magnets?

A. Yes, sir; I think it has a relation, since the use of the word "either" in those claims mentioned in your question, as set up in the Lyndon patent, refers, in effect, to energizing either magnet coil 15 or the energizing of magnet coil 16, it depending on which one of these two is energized as to the direction in which the water-gate-mechanism is operated.

Q. 495. And, furthermore, if the by-pass were to be employed only in the closing actions of the water-gate, the sequence of energization would not include any energization for operating the by-pass in the opening of the water-gate, would it?

Mr. Westall: Counsel for the defense calls the attention of the court to the fact that many of these questions on redirect examination are very grossly leading and are objectionable on that ground, and

counsel objects to the question as leading.

Mr. Blakeslee: If counsel wishes to object to any questions we will ask him to do so, and will try to consider the objection. But attention is called to the fact that the examination of the present witness was very protracted and that the cross-examination has gone very extensively and repetitiously, at times, over matters which have been referred to, and we are merely attempting to bring this examination to as speedy an end as possible with a fair questioning of the witness to clear up any points which may be left obscure by the cross-examination.

A. No, sir.

Q. 496. Now, furthermore, as in Claims 3 and 4 no by-pass is mentioned, this same term "either" is used with respect to the direction in which the water-wheel may be governed, what have you to say with respect to the sequences of such energizations and de-energizations, and the inclusion or exclusion of such sequences of the energization and de-energization of electro-magnet 64 controlling the clutch which operates the by-pass valve.

A. I should say that the use of the word "either", especially in Claims 3 and 4, would indicate to me that the contacts could be made energizing either coil 15 or 16, but not necessarily contacts made so as to energize magnet 64 and placing in operation the clutch 57 58 or moving the by-pass at all.

Q. 497. Now, with respect to the location of the water-wheel to be controlled as to its speed in accordance with the Lyndon invention, what have you

to say as to the use or general knowledge of water-wheels at the time of the application for the Lyndon patent in suit, concerning their mounting, and the planes of mounting, or planes of rotation?

A. A great many water-wheels were certainly in use and well known that were so-called horizontal water-wheels, and a great many so-called vertical water-wheels. In fact, it is merely the convenience or adaptability in each individual case which would indicate which was to be preferred. There is absolutely no essential difference whether it is mounted horizontally or vertically.

Q. 498. Now, I take it from your previous testimony that Lyndon shows and describes in his patent in suit one form or combination of parts and features such as that portrayed in the drawings. In practice, with the invention, within your explanation and application of the principles thereof, can you conceive or tell us about other arrangements or adjustments which are mechanically evident so as to adapt the invention to the varying conditions of service, and, particularly, we will say, with respect to the use of the by-pass valve 48?

A. The invention as described in the patent in suit, as I would interpret it, indicates a particular combination of elements and their adaptability for certain purposes, and it is apparent to one who is experienced and skilled and has knowledge of the results to be accomplished, that many different arrangements might be made of the devices as disclosed in the patent. I think I have mentioned a very great

number, if necessary or desirable, especially as regards the best position of either the water-gate valve or the by-pass valve, to be in accordance with certain specific requirements that might be found in individual cases. I have had experience myself with cases where the best operative position of the water-gate would be very nearly fully open and in other cases the best position would be very nearly entirely closed. So that you might say the normal position might be either one of those two. And the same thing applies absolutely to the position of the by-pass valve 48, depending entirely upon the conditions of operation and the requirements for the use of the water, and so on, all of which, to my mind, are apparent to anyone experienced and having knowledge of such devices, from the disclosures in the patent itself.

Q. 499. Now, referring to Claim 7, there is the statement in lines 75, 76, 77 and 78: "So as to control such valve inversely to the control of the water-gate, during the governing action of the water-gate." Considering such language with the rest of the claim, what do you take it the meaning of the claim is, with respect to such inverse movement of the by-pass valve, if, for instance, it be in both directions?

A. I would interpret that statement contained in the question, beginning from line 75, "so as to control such valve", as meaning the by-pass valve "inversely to control the water-gate during the governing action of the water-gate" to mean that the control was inverse in the two valves during the governing action of the water-gate or during the actual

motion of the water-gate.

Q. 500. And during the action of the water-gate and the governing action, may or may there not be one or more movements of the by-pass valve after it has left the position it assumes when no governing action has taken place?

A. Certainly; there may be a number of intermittent motions of the by-pass valve during the motion of the water-gate itself.

Q. 501. And, therefore, if the by-pass valve only leaves its position assumed when no governing action has taken place upon the movement of the water-gate in one direction, is it or is it not possible for there to be opposite movements of the by-pass valve during the governing period?

A. Yes, sir.

Q. 502. Now, if, as you have previously testified, the use of the Lyndon governing invention is to correct those unfavorable or dangerous conditions which exist both in connection with the supply of water through long pipe lines at a high head and through short pipe lines at a low head, do you or do you not think it fair to assume that the invention is equally practiced or utilized in meeting either one or the other of these unfavorable or dangerous conditions in governing the water-wheels?

A. Yes, sir; and it is particularly set forth in the specifications by Lyndon. He desires to prevent excessive action of the governor in either direction. I refer to lines 36 and 37 of page 1. Further, on page 4, beginning with line 88, "It is here to be noted that

all water-wheel governors as made today must accomplish their governing only at such a speed as the acceleration or retardation" either one "of the water in the column of the pipe can be accomplished."

Q. 503. Now, assuming therefore for the purposes of this question, that in Exhibits U and V and Exhibits KK and KKK, the by-pass valve is normally in or approximately at a closed position when the governing action is not taking place, I will ask you to state whether you do or do not think that such arrangement and setting of the governor apparatus, including the by-pass valve, comes fairly within the meaning of the invention set forth in the Lyndon patent in suit?

A. It certainly does, and the best possible indication of that is, to quote again, the words that I have just quoted in my last answer on page 4, lines 88 to 93, inclusive, that "all water-wheel governors as made today must accomplish their governing only at such a speed as the acceleration or retardation of the water in the column of the pipe can be accomplished". It specifically indicates that the by-pass shall be adapted in its opening to the best accomplishment of appropriate retardation or acceleration of the water in the pipe line.

Q. 504. And, looking further on, namely, at the substance of lines 96 to 98, inclusive, after the comma in line 96, do you or do you not take it from such language that the present invention is to meet and provide for and correct the conditions which were

known previously to exist on either side of the case as now considered, as well as on both?

A. Yes, sir; because the Lyndon patent specifically sets forth what is to be accomplished as a result of the invention is that either the retardation or acceleration of the water in the pipe shall be accomplished at just the rate that is proper, and that the time element is removed entirely from the gate valve and the water-wheel, and that the water in effect is taken care of in the by-pass, indicating that whatever adjustment is necessary for the normal position of the by-pass may be made in order to take care of the water.

Q. 505. And bearing upon this distinction, or this clear recognition of the two uses or different applications and utilizations of the governing action of the Lyndon patent in suit, do you or do you not consider it significant that in Claim 6, for instance, the words "either direction" are used with respect to the operation of the water-gate, but are not used with respect to the operation of the by-pass valve.

A. Yes, sir; and especially is that significant in Claim 7, beginning with line 78 and reading "and means for returning the by-pass valve to normal position on completion of governing movement of the water-gate operating means".

Q. 506. With respect to your distinction between physical equivalent and mechanical equivalent, I will ask you to state in a single answer your distinction between these two equivalences.

A. I meant to be understood by "physical equiv-

alent" that they are physically the same in detail and in construction and in parts; that in mechanical equivalent the same mechanical results may be obtained from the two. For instance, a fly-ball governor is not the physical equivalent of a dynamo, but the results that may be accomplished with a fly-ball governor driven at variable speeds would be exactly the same as the results that may be accomplished with a variable electro-motive force produced by a dynamo operated at variable speeds.

Q. 507. And do I take it that in so defining a physical equivalent you would more or less imply shape, weight, mass, delineament, etc., than in defining a mechanical equivalent?

A. Yes, sir.

Q. 508. Now, going further into the analogy between the controller called for in the Lyndon patent in suit and the part marked B by you on Complainant's Exhibit KKK, may it not be said that the part between the two pistons in the controller cylinder bears an analogy to some part in the controller of the disclosure of the Lyndon patent in suit?

A. It bears some analogy, perhaps. In fact the part D between the two pistons corresponds to the soft iron core 34 of the Lyndon patent, motion being transmitted to each, namely, the part between the two pistons in the alleged infringement and the soft iron core as the result of variation in speed of the water-wheel shaft.

Q. 509. I will ask you what these two parts or pistons do in the action of the controller?

A. I have already testified that in effect they act to open or close the openings to the two pipes DD, accomplishing the same result as the making of contacts in the Lyndon patent.

Q. 510. And is there anything in that cylinder which tends to resist such movements of such pistons?

A. The pressure of the fluid, whatever it may be, which is transmitted through the two pipes DD to the cylinder with its piston A.

Q. 511. And in the Lyndon patent in suit is there anything tending to resist the movement of the core of the solenoid 33?

A. Yes, sir.

Q. 512. What is that?

A. Springs 27, 28, 29 and 38.

Q. 513. And is there one or more contacts controlled by the movement of the core of the solenoid 33 in opposition to such resistance?

A. There are two contacts; yes, sir.

Q. 514. Can you compare that duality of the two contacts with any similar provision shown in Complainant's Exhibit KKK.

A. Contacts 41 and 41a might be compared with the opening in one of the pipes D, while contact 40 and 40a might be compared with the opening of the other of the two pipes D.

Q. 515. In the Lyndon patent in suit you have testified about two electro-magnetic devices which control the clutch, 9, 10 and 11, throwing in the clutch, so that the shaft controlled thereby operates

in one direction or the other. How does the provision and action of the two pipes D compare with the provision and action of these two electro-magnetic devices, between 15 and 16?

A. It may be said to be compared, one of the pipes corresponding to the electro-magnet 15 and the other pipe to the electro-magnet 16, or, perhaps, the wire on the electro-magnets to compare with the pipe, the pipe in one case allowing the pressure fluid to flow and in the other case the wire allowing the electric fluid to flow.

Q. 516. You have pointed out the electric circuit control on the electro-magnet 64 which throws the by-pass in or out of operation. Do you find in Complainant's Exhibit KKK any system or group of parts acting upon the clutch M controlling the by-pass valve?

A. I should say that the corresponding mechanical equivalent of the circuits controlling the magnet 64 which operates the clutch 58 57 would be the oil which circulates within the dashpot M.

Q. 517. And what do you find acting upon this oil between the same and the shaft F?

A. I find a lever arm which is not lettered but which I now give the letter N.

Q. 518. And what analogy, if any, can you draw between these parts and the circuit of electro-magnet 64?

A. I suppose the lever arm 61 might be made to correspond with lever arm N.

Q. 519. And, further, as to any analogy shown

between the parts actuating the clutch M and the shaft F and the means controlled by and also including the circuit through the electro-magnet 64?

A. Well, I should say the only thing I could indicate would be that the control in the alleged infringement comes from the controller cylinder B in exactly the same way as the control comes from solenoid 33 in the Lyndon patent.

Q. 520. You have pointed out certain circuit controllers between solenoid 33 and the actuating parts of the Lyndon patent disclosure. Do you or do you not find any parts extending from the controller B between which and such circuit controllers any analogy can be drawn?

A. I find the two pipes DD which can be said to correspond with the electrical circuit.

Q. 521. And how with respect to the action of the two pistons of B with respect to the orifices of the pipes D?

A. The pair of pistons within the controller B may be said to correspond with the contacts 40 40a, 41 and 41a, of the Lyndon patent controlling the delivery of the liquid to the pipes D.

Q. 522. Now, as to these plants which you have approximated at fifty which you have said, according to your information, are so organized as to operate in accordance with the invention of the Lyndon patent in suit. Can you or can you not say whether there is mechanical equivalence between their organizations and the organization disclosed in the Lyndon patent in suit?

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A. I should say they are mechanical equivalents of the system of governor disclosed in the Lyndon ~~of the system of governor as disclosed in the Lyndon~~ to accomplish the same things in these various plants as regards the control of the water to the water gate and to the pipe line as set forth in the Lyndon patent.

Q. 523. Do you know of any such plant among these same fifty in number which has been operated in connection with cement works?

A. Yes, sir.

Q. 524. What conditions were to be met with there, and how were they met with?

A. The conditions to be met were the control for constant speed on account of the great variation in load at the cement mill, and results were accomplished with the use of the by-pass valve, reducing the consequences of either excessive retardation or acceleration of the water in the pipe line, as well as to the water tunnel which terminated in the pipe line.

Q. 525. What can you say further with respect to the operation of the embodiment of the Lyndon invention in that plant responsive to the conditions of service there met with?

A. The essence of the Lyndon patent, as I understand it, was adapted to that plant in connection with the control of the water-gate and the required operation of the by-pass valve.

Q. 526. Was this of limited or extensive value and advantage in this instance?

A. Extensive value, because prior to the introduction of the system of governing it was impossible for a company to give satisfactory service.

Q. 527. Do you find any parts or features of the alleged infringing structures as portrayed in Complainant's Exhibit KKK, for instance, which, in your opinion, as one skilled in the art as a mechanical and electrical engineer, would require more than the ordinary engineering skill to build and provide in utilizing the invention of the Lyndon patent in suit, if it were desired to construct a purely mechanically installation and embodiment, in contradistinction to one partly mechanical and partly electro-mechanical, in accordance with that described and pictured in the Lyndon patent in suit?

A. I don't think it would require any extraordinary engineering ability from one skilled in the art to construct the governing mechanism as set forth on blue prints KKK, after having had available the disclosures of the Lyndon patent. There would be mechanical details to work out, but the principles are all there.

Mr. Blakeslee: That is all.

RE CROSS EXAMINATION

By Mr. Westall:

Q. 528. How would you define a by-pass?

A. I would define a by-pass as an extra or separate outlet. Applied to this particular case, it would be an outlet for water so that it would not be necessary to have all of the discharge go through one

opening, but to actually use the name itself, to by-pass the water or send it by or get it by through another separate opening.

Q. 529. Would the auxiliary nozzle disclosed in Exhibits U and V be any the less a by-pass because the water ejected therefrom might strike the buckets and interfere with the operation of the water-gate?

A. It would be no less a by-pass from the standpoint of the pipe line, but it would be something other than a by-pass so far as the wheel is concerned.

Q. 530. The additional function without any other change would not lead you to call it by any other name than a by-pass?

A. I think I would. I would call it a second water-wheel nozzle.

Mr. Westall: That is all.

(It is stipulated that the party taking depositions will furnish to the opposite party a copy of the said depositions, the cost of such copy to be taxed as part of the cost against the losing party.)

(By consent of counsel for both parties an adjournment is now taken until Friday, January 30, 1914, at the office of counsel for the Complainant, in Los Angeles, as heretofore.)

insert > February 16, 1914, P. M.

E. F. SCATTERGOOD, a witness previously subpoenaed, sworn and examined on behalf of Complainant, being recalled for further examination,

532 27 insert "Los Angeles, Cal., February 3, 1914.
3 o'clock P. M.

This being the time and place to which the further taking of proof in this matter was by consent of counsel continued, the said taking of proofs is now resumed.

Present:

Raymond Ives Blakeslee, Esq., solicitor for complainant.

Joseph F. Westall, Esq., solicitor for defendant.

Mr. Blakeslee:—We offer in evidence on behalf of Complainant a printed copy of the charter of the City of Los Angeles bearing the certificate of the city clerk of the City of Los Angeles, under date of the 2nd day of February, 1914, that said printed copy is a full, true and correct copy of the city charter of the city of Los Angeles as amended March, 1913, and we offer the same and ask that it be marked as Complainant's Exhibit MM.

Mr. Westall:—Counsel for defendant objects to the document referred to as incompetent, irrelevant and immaterial, as not being properly certified and as not being the best evidence.

(The said document so offered in evidence is marked by the Examiner as Complainant's Exhibit MM.)

(By consent of counsel for both parties an adjournment is now taken until Friday, February 6, 1914, at 2 o'clock P. M.)

UNITED STATES OF AMERICA,

Southern District of California:—ss.

I, I. Benjamin, Special Examiner in Chancery, duly appointed and certified as

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such in the above entitled case, do hereby certify the foregoing to be a full, true and correct transcript of the proofs taken in said case before me upon the several dates therein specified and all the proofs so taken up to this date. I further certify that this certificate is made with the reservation on behalf of the several witnesses who testified in said cause to read over their said depositions and, if they so desire, to correct the same, an opportunity for such reading over and correction not having as yet been available to the said witnesses.

In witness whereof I have hereunto set my hand this eleventh day of February, 1914.

I. Benjamin,

Special Examiner in Chancery.

Mr. Blakeslee:—Complainant also offers in evidence a blue print containing three numbered figures with lettering and unnumbered figure, and also inscribed with matter pertaining to the several figures, the same further bearing an indorsement of the title of this case and the words and figures “Prepared by me in further illustration of my testimony previously given in this case. Dated February 12, 1914”. and under said latter indorsement, signed “Geo. J. Henry, Jr., (Complainant)”, the same having been received this day through the mails by counsel for complainant from the complainant, responsive to a request to complainant made by complain-

ant's counsel during the preceding week, and I ask that the same be marked complainant's Exhibit OO. This exhibit is offered for the purpose of facilitating the presentation of this case to the Court and clearly defining or assisting in defining the issues presented in this case.

Mr. Westall:—Counsel for the defendant objects on the ground that the drawing and purported explanations thereon are incompetent, irrelevant and immaterial, no foundation laid, and that the said explanations are hearsay.

(The Examiner thereupon marks the said blue print as Complainant's Exhibit OO.)

Mr. Blakeslee:—Similarly, Complainant offers in evidence a further blue print showing four numbered figures of drawings and one unnumbered figure of drawing, to which is similarly applied descriptive matter pertinent to the several figures, and which is similarly indorsed with the title of this case and also indorsed "Prepared by me in further illustration of my testimony previously given in the case. Dated February 12, 1914," and signed "Geo. J. Henry, Jr., (Complainant)", the same having been similarly received by Complainant's counsel through the mails this day pursuant to a similar request made of Complainant the preceding week. And we ask that this blue print be marked Complainant's "Exhibit PP." This exhibit is offered for similar assistance in presenting and defining the issues of this case before the Court.

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That is, for facilitating such presentation and definition. Counsel further states that all of the indorsements on Exhibits OO and PP, together with the signatures of the Complainant, appear to be in the handwriting of the Complainant with which counsel is well acquainted.

Mr. Westall:—The same objection is repeated.

Mr. Blakeslee:—Counsel for Complainant desires the record to show that the motions for discovery or for an order that the defendants submit to and assist in the examination of the alleged infringing plant in Inyo County, California, and that defendants submit contracts, specifications, drawings, blue prints, and other papers and things tending to further show or which might reasonably show the constructions, inter-relation and operation of the governor mechanisms which the witnesses for Complainant have testified to as being present in the said alleged infringing plants, in Inyo County, California, as to which motions notice was previously given upon the record, and notice of continuance given defendant from time to time, were withdrawn upon notice to the Clerk of the Court and to counsel for the defendant on the 13th day of February, 1914. The attention of the Court is, however, called to the fact that the demands noted upon the record and made of defendant for inspection and submission of and with respect to things concerned in said

motion, still stand upon the record, such demands having been repeated after being first made as the record will show; and we further wish the record to show that no compliance in any respect has been made with such demands. We submit that these demands were reasonable and proper and more particularly so in view of the early dealings in these matters between Complainant's counsel and the City Attorney and prior counsel for the defendant. It is believed that had these demands been complied with the already ample record on the *prima facie* case might have been abbreviated and the Court might have been assisted in expeditiously and clearly grasping the more or less complex questions of structure entered into in the *prima facie* case as made out.

Mr. Westall:—Counsel for the defendant calls attention to the fact that the most of the record herein was made before any of the times set for the hearing of the motion referred to, and that the testimony as to the infringement had been taken long before there had been any opportunity for a hearing of said motion. Counsel for the defendant also disclaims any opposition to such motion if it had been kept within bounds, which would have required the production of evidence which would have been pertinent to any issue in this case.

Mr. Blakeslee:—The record shows the demands and requests upon which the motions

Page Line

were based were made early in the course of making Complainant's prima facie case, and the defendant had full opportunity to submit such papers and other things as it thought fairly responsive to such demands. The prima facie case speaks for itself and we are prepared to close the same after the further examination of the witness Scattergood, who we understand counsel for defendant states, is ready to reappear and who was to reappear this day.

As he has failed to do so, we will ask that an adjournment be noted until the hour of ten o'clock A. M. of February 17, 1914, and we will ask counsel for defendant to endeavor to have said witness Scattergood present at that hour to obviate the necessity of subpoenaing him.

(After the above request for postponement was made, the witness Scattergood appears.)"

at the time there was only one operating. There was a great deal of the time when there was not water enough in the creek to operate even one unit. The city's scheme in connection with the development of that creek is to provide reservoirs ultimately and install two additional plants, but the reservoirs had not yet been provided. And in the dry months of the year the water, a great deal of the time, runs below the amount required for the operation of one unit. The Division Creek No. 2 plant has been operating, I should judge, about two-thirds of

the time since it was installed. At the present time and for considerable time past—something like a year—there has been with some exceptions but one unit operating of the two plants. That is, of the total or three units. Part of the time a unit on the Cottonwood plant and part of the time a unit on the Division Creek No. 2 plant was operated. And the load has been but a fraction of full load for one unit most of the time. This condition has prevailed since the construction work on the aqueduct was practically completed. That is the best I can do from memory in regard to the operation of those plants. I have not followed it from day to day.

Q. 76. Am I to understand that since these plants were installed there has been from time to time an operation of each of the units of the Division Creek No. 2 plant and the Cottonwood plant up to the present time?

A. Yes. The three units have been kept in operating condition with the exception of very short intervals, and have been operating intermittently.

Q. 77. Now, please state a little more fully what was done with the electrical energy produced by these two plants under discussion. That is, what utilization was made of that energy during all the time since their installation.

A. Of course, there was no use made of it before their installation. The plants were installed for the furnishing of power for use in connection with the construction of the city's aqueduct and were installed of a permanent character with a view to their use

in conjunction with the city's complete aqueduct power project as planned, which involves four large plants along the line of the aqueduct, utilizing the waters in the aqueduct, and some additional plants on certain natural streams in the Owens River watershed. The great bulk of the energy which has been supplied in these plants has been used for that purpose. There has been a small amount of energy for the past two or three years used in rendering service to inhabitants of the lower end of the Owens Valley, practically at cost, and at times below cost, and at times somewhat above cost, depending on the amount of energy being used from time to time in response to their petitions and for their accommodation.

Q. 78. When you refer to "the city" and "the aqueduct," please state, for the purposes of the record, a little more fully what you mean.

A. The city of Los Angeles and the aqueduct that brings the water supply from the Owens River Valley to the city of Los Angeles.

Q. 79. Do you know what disposition was made of any rates collected for the supply of electrical energy from these plants to the residents of the Owens Valley? That is, what was done with the funds collected from such residents for such energy?

Mr. Westall: Objected to as incompetent, irrelevant and immaterial.

A. My recollection is that during the period of aqueduct construction funds were kept account of by the aqueduct accounting department, both as to

cost and receipts, and I don't think they were distinguished from the regular aqueduct funds, but of that I am not certain. More recently the aqueduct was in the hands of the Public Service Commission, which Commission has charge of the operation, maintenance and extension of these water works and supply and the rendering of that service is in the hands of that Commission. I have nothing whatever to do with it personally other than to advise in regard to electrical matters from an engineering standpoint from time to time as formerly.

Q. 80. By Mr. Blakeslee: Captain Hance, the treasurer of the city of Los Angeles, has testified that as yet no funds have come into the city treasurer's hands for the sale of electrical energy generated by these plants. Can you explain how that might be accounted for?

Mr. Westall: Same objection.

A. No further than I have already just now testified.

Q. 81. By Mr. Blakeslee: Will you kindly state some of the purposes for which the electrical energy generated by these plants was used in the development of the Los Angeles aqueduct?

Mr. Westall: The same objection.

A. The city constructed a 30,000 volt power line extending all the way from the intake in the Owens Valley north of Independence to a point just a few miles northeast from Mojave along the aqueduct, and from that point on to the city's cement plant located between Mojave and Tehachapi. The electri-

cal energy was used for the operation of motors, hoists, electric locomotives, electric shovels, in connection with the work of excavating and the work of lining the aqueduct with concrete, and in connection with the lighting of the camp and the works. A considerable portion of it was used to supplement the steam plant at the cement plant in the operation of the city's cement plant.

Q. 82. By Mr. Blakeslee: You have previously identified Complainant's Exhibit O. Can you state whether the dredge shown herein was operated by electrical energy from either of these plants in the development of the Los Angeles aqueduct?

A. It was operated from the 30,000-volt power line that I have referred to, which was supplied with energy from the Division Creek No. 1 and No. 2 plants and the Cottonwood plant, and steam plant at the cement mill referred to. At times the steam plant at the cement mill supplied energy for work along the line when the power of the three plants was insufficient.

Q. 83. And this dredge was used in making the excavation which formed part of the Los Angeles aqueduct?

A. It was used in connection with the portion of the excavations referred to by me a few minutes ago. Yes, sir.

Q. 84. In referring to the city of Los Angeles do you mean the city of Los Angeles, California, with whose departments you are connected?

A. Yes, sir.

Mr. Blakeslee: That is all.

Mr. Westall: Cross-examination is waived.

Mr. Blakeslee: Counsel for Complainant announces that the Complainant's prima facie case is now closed.

The Examiner here states on the record that Exhibit W was brought by him as Special Examiner from the session for taking testimony on behalf of Complainant in San Francisco. And that upon delivering same to counsel for Complainant I find that in such transportation a break has occurred in one of the white metal parts on the exhibit. I certify that originally the two parts thus severed were one continuous unbroken part of rigid metal, and that the same was inadvertently broken in transportation from San Francisco to Los Angeles. The little fragments produced by the breaking I have placed in the cup of the dashpot.

insert > MICHAEL KVAPISHEVSKI, being called as a witness on behalf of Defendant, being first duly sworn, testified as follows:

DIRECT EXAMINATION

By Mr. Westall:

Q. 1. State your name, age, residence and occupation.

A. Michael Kvapishevski; age, thirty; residence, 557 South Fremont Avenue; passenger agent of San Pedro, Los Angeles and Salt Lake Railroad.

Q. 2. Are you acquainted with the French

538 18 insert "IN THE UNITED STATES DISTRICT COURT, SOUTHERN DISTRICT OF CALIFORNIA, SOUTHERN DIVISION.

GEO. J. HENRY, JR.,
Complainant,

vs.

CITY OF LOS ANGELES,
Defendant.

No. 87-A In Equity.

Testimony taken on behalf of Defendant in

the above entitled cause, pursuant to stipulation and order of the court heretofore entered, before I. Benjamin, Special Examiner in Chancery, at 311-313 International Bank Building, at 10 o'clock A. M. on April 1, 1914, pursuant to notice heretofore given.

Present:

Raymond Ives Blakeslee, Esq., Solicitor for Complainant.

Joseph F. Westall, Esq., Solicitor for Defendant."

language sufficiently well to be able to translate a French patent involving a water-wheel governing apparatus?

Mr. Blakeslee: Objected to as irrelevant, incompetent and immaterial, no foundation laid, not the proper method of qualifying the witness as an expert, if that is the object of the inquiry.

A. Yes.

Q. 3. By Mr. Westall: Will you please look at the patent I now hand you and state whether or not you understand the language in which that patent is written.

Mr. Blakeslee: The same objection, and that it involves a conclusion, namely, that the paper handed the witness is a patent.

A. Yes.

Q. 4. By Mr. Westall: Have you examined that document with a view of furnishing a translation thereof?

Mr. Blakeslee: The same objection.

A. To furnish an exact translation.

Q. 5. By Mr. Westall: Will you please look at the paper I now hand you and state what it is.

Mr. Blakeslee: The same objection: that it is not the proper method of proof, no foundation laid, and the witness is not qualified.

A. That is an exact translation of the French patent and a description of the French patent.

Q. 6. By Mr. Westall: Who made that translation?

Mr. Blakeslee: The same objection.

A. I did.

Q. 7. By Mr. Westall: What mechanical experience or training have you had which would tend to give you the command of language and understanding of mechanical devices, sufficiently to enable you to properly translate from the French language to the English language a patent involving a water-wheel governor?

Mr. Blakeslee: The same objection, and that it is leading and not the proper method of establishing the qualifications of the witness.

A. I had four years education in the University of Dresden, Saxony, and my French is acquired from my home education as a child.

Q. 8. By Mr. Westall: Did you ever reside in France?

A. Oh, yes.

Q. 9. How long did you live there?

A. I was in Paris about ten times spending a couple of weeks, and in Belgium in Lieges and Brussels.

Q. 10. Is the paper which you have identified as a translation a true translation of the French patent?

Mr. Blakeslee: Objected to as not the best evidence and not the proper method of proving a translation.

A. It is an exact translation.

Mr. Westall: Counsel for Defendant offers in evidence the French patent No. 291588, granted August 8, 1899, to Escher, Wyss & Company, and ask

that the same be received in evidence and marked "Defendant's Exhibit French Patent" for identification.

Mr. Westall: Counsel for the Defendant offers in evidence the document identified by the witness as a true translation of the French patent just above referred to, and ask that it be received in evidence and marked for identification "Defendant's Exhibit Translation of French Patent."

Mr. Blakeslee: As to the attempted offer of these Exhibits or purported Exhibits, Compainant's counsel objects, respectively, as follows:

As to the attempted offer of the alleged copy of French patent, the objection is made that the copy is not identified, bearing no certification such as is required by the statute, as to its genuineness, particularly in that no certification appears by any consular officer or other persons recognized under the revised statutes as eligible and competent and legally qualified to certify to and identify any such copy of a foreign patent or other publication purporting to have been made outside of the United States of America.

Second: There is no certification whatsoever to the genuineness or correctness of this purported copy of the French patent, in the English language, and cognizable by the Federal Courts of this country or any other court.

Third: There is not a physical attachment or connection of the several parts of this purported copy of the patent which would bring all the parts

thereof under any alleged certificate or purported means of identification.

Fourth: The objection is made to the introduction of this Exhibit that there has been no foundation laid for its introduction; that this purported copy is not the best evidence and no foundation has been laid whatsoever for the introduction of secondary evidence, and, therefore, and for those reasons, this purported copy is irrelevant, incompetent and immaterial.

Fifth: The objection is made that there is no certificate accompanying and relating to this purported copy of the French patent which in any way establishes any of the purported data or disclosures thereof, including dates, names, numbers and sources of grant or issuance of the patent of which this purports to be a copy, the paper and what appears to be a tracing accompanying it and the red ribbon and other physical annexations being not entitled to recognition as evidence or any evidence by this court as anything but an incompetent aggregation of its several unidentified parts.

Upon the above the Complainant objects to the offer of this alleged copy as an exhibit and to its consideration in any manner whatsoever in this case.

As to the purported translation of the purported contents of this purported French patent, we object on the ground that such purported translation has not been proved and that the witness has not qualified to prove it, and that it is irrelevant, incompetent and immaterial, and cannot be considered in this

case either with or independently of the purported copy of the purported French patent, being Defendant's Exhibit French Patent, and we object to its consideration in any manner in this case upon these same grounds.

(The said Exhibits are thereupon respectively marked "Defendant's Exhibit French Patent," together with the title of the court and cause and the date of the offer of said Exhibit, and

("Defendant's Exhibit Translation of French Patent", together with the title of the court and cause and the date of the offer of said Exhibit.)

Q. 11. By Mr. Westall: Will you please look at the document I now hand you and state, if you know, what it is.

A. I looked it over and translated it, but I cannot give you an answer—

Q. 12. I mean, what kind of a paper is it?

A. It is a Swiss patent for a mechanism for the regulation of a by-pass.

Mr. Blakeslee: We object to this on the ground that the witness is not qualified to answer the question, and we ask that that portion of his answer relating to the subject matter or purported subject matter of this paper be stricken out as not responsive to the question.

Q. 13. By Mr. Westall: Do you understand the language in which the document which I have just handed you is written?

Mr. Blakeslee: Objected to as leading.

A. Yes, sir.

Q. 14. By Mr. Westall: What language is it?

A. It is written in German, which language I understand thoroughly.

Q. 15. Have you examined that document with a view of furnishing a translation thereof?

A. Yes, sir.

Q. 16. Will you please look at the paper I now hand you and state what that is.

A. That is a translation of the Swiss patent.

Q. 17. Of the Swiss patent just referred to?

Mr. Blakeslee: We object to this question as leading.

A. Yes.

Q. 18. By Mr. Westall: State whether or not the translation just referred to in your last preceding answer is a true translation of the document you have before you.

Mr. Blakeslee: Objected to as irrelevant, immaterial, incompetent, no foundation laid, the witness not having qualified to answer the question, and as leading.

A. Yes.

Q. 19. By Mr. Westall: State whether or not you understand sufficiently the device described and shown in the Swiss patent which has been handed you, to furnish an accurate and complete translation from the German language into the English language.

Mr. Blakeslee: Objected to on the same grounds.

A. Yes; I had the German technical education which made it possible for me to understand the

German and Swiss patents thoroughly.

Mr. Westall: Counsel for Defendant offers in evidence the patent just referred to, being Patent No. 17536, granted on the 15th day of December, 1898, to Irene Schaad, and ask that the same be received in evidence and marked for identification "Defendant's Exhibit Swiss Patent".

Mr. Blakeslee: As to the offer of this paper as an Exhibit, we object upon each and every one of the grounds registered against the attempted offer of Defendant's Exhibit French Patent, with the exception of those parts of those objections which relate to the physical separateness of the purported drawing and the rest of the purported copy and to the pink ribbon which seems to have been omitted from this Exhibit. And we register the further objection that this purported copy of the Swiss patent is entirely irrelevant, incompetent and immaterial for the further reason that it does not come within the pleadings in this case, no reference to the same being made in the answer interposed by the Defendant in this case, no reliance, therefore, being placed upon the same by the Defendant in its defense or being capable of being placed upon the same. And we therefore finally object to its offer and identification in this case and to its consideration in any respect in determining the issues of this case.

As to these two purported attempted Exhibits, namely, French patent and Swiss patent, we further object to the implication in the requested details of these Exhibits that they are French and Swiss pat-

ents, respectively, or any patents at all, the very offer of the Defendant being coupled with a reference to these purported copies as such copies and not as patents. The original patents are not produced, and for the reasons stated, are not reflected or represented in any manner by these purported copies in accordance with the objections registered.

Mr. Westall: As to the objection that the Swiss patent offered in evidence has not been set up in the answer, counsel for Defendant calls attention to the fact that there is now pending a motion to amend the answer to correct an error in the number of the patent as set up in the original answer, and that but for the congested condition of the calendar of the court that motion would undoubtedly have been passed upon last Monday.

Mr. Blakeslee: Not only is there a variance as between the number of this purported copy of the Swiss patent and the number set up in the answer, with respect to a purported Swiss patent, but there is a variance as between the purported date of this purported copy of the Swiss patent and the purported date of the purported Swiss patent set up in the answer; and, furthermore, we are proceeding in this case under the answer on file and under which proceedings on behalf of Complainant were taken in this case, and which was filed in this case many months ago, and the pendency of any such motion cannot in any way affect the pleadings in this case; and the blanket objection is made at this time without the necessity of

repetition, as to every bit and scrap of purported evidence or testimony which may be attempted by counsel for the Defendant to be taken, produced or offered in these proceedings, which is at variance with the pleadings of the answer on file or which is not included therein unequivocally and definitely. The proposal to introduce evidence at this time not covered by the pleadings in the case, after diligent procedure by the Complainant based upon an answer filed before the Complainant made his prima facie case, is strenuously objected to and it is urged that any such motion to amend as may be pending in this case was not brought with diligence, and its approval by the court or any order approving the same will be strenuously opposed by counsel.

(The said Exhibit is thereupon marked "Defendant's Exhibit Swiss Patent", together with the title of the court and cause and the date of the offer of said Exhibit in evidence.)

Q. 20. By Mr. Westall: Referring again to the paper identified by you as a translation of the Swiss patent, will you please state whether or not that is a true, complete and accurate translation of the Swiss patent referred to?

Mr. Blakeslee: Objected to on the ground that the witness is not properly qualified.

A. Yes, sir.

Mr. Westall: Counsel for defendant offers in evidence the paper referred to by the witness as an accurate and correct translation of the Swiss patent, numbered 17536, dated December 15, 1898, and asks

that said translation be received in evidence and marked "Defendant's Exhibit Translation of Swiss Patent".

Mr. Blakeslee: The Complainant objects to the offer of this purported translation upon each and every one of the grounds of objections urged against the offer of Defendant's Exhibit "Translation of French Patent".

Mr. Westall: In view of some of the foregoing objections of counsel for Complainant, I wish to say that in setting this time before the final disposition of the pending motion to amend the answer, I have only acted with a view of expediting the cause and getting the evidence in within the time allowed by the court. Attention is called to the fact that the Complainant in this case has had to put in his prima facie case sixty-five days, and that a fair division of the time should permit Defendant to have the extension asked for. But, in view of the fact that the congested condition of the calendar will not allow the court for several weeks to pass upon the proposed amendment to the answer, as well as upon the motion for an extension of time, counsel for the defendant is using every reasonable effort without regard to strict technicalities for the expedition of the case, and notice is hereby given that when that motion is finally reached the court will be asked to enter any order nunc pro tunc as of March 30, 1914, at the time when the motion was originally made.

Mr. Blakeslee: We renew our notice to the Defendant that we shall contend that the present pro-

ceedings on behalf of the Defendant are, as they can only be considered, taken and had under and in accordance with the pleadings as they stand in this case to date, and that such pleadings determine what evidence may be adduced or attempted to be adduced by the Defendant in this case. The attention of the court is further called to the fact that Defendant has had forty-three days prior to this present time in which to proceed to take its proofs in this case, and that there has been no attempt or move made to take any such proofs prior to this time. As to the suggestion that there be a fair division of time for taking the proofs in this case, attention is called to the fact that the Defendant's time to take proofs prior to rebuttal proceedings runs to and including the 2nd day of May next, one month and one day from date, giving the Defendant a total time to take proofs of seventy-five days, as the matter now stands, as against the Complainant's time of sixty-five days referred to. And, as this case is set for final hearing for the 26th day of May next, Complainant will have remaining to him but twenty-four days within which to take his rebuttal proofs, a less time than that provided for in the stipulation extant in this case. It is contended that all the diligence and all the consideration attached to Complainant's actions in this case, and that Defendant has had and now has an over-abundance of time in this case, and to bring any such motion as that referred to, had there been diligence in such procedure.

Mr. Westall: You may cross-examine, Mr. Blakeslee:

Mr. Blakeslee: Cross-examination is waived.

EDWARD S. COBB, being called as a witness on behalf of Defendant, being first duly sworn, testifies as follows:

DIRECT EXAMINATION

By Mr. Westall:

Q. 1. State your name, age, residence and occupation.

A. Edward S. Cobb, fifty-six years old, I reside in Whittier, California, and I do business as a consulting engineer at 1121 Central Building, Los Angeles.

Q. 2. What education, experience and training have you had which would tend to qualify you to testify as an expert in a patent case involving a water-wheel governor?

Mr. Blakeslee: Objected to as leading and calling for a conclusion, and not the proper method of establishing qualification.

A. I was educated in the Worcester Polytechnic Institute at Worcester, Massachusetts, from 1875 to 1879, in a course of mechanical engineering; followed railroading one year; opened an office in Boston in 1880 for the designing of machinery; in 1882 I was appointed Professor of Practical Mechanics and machine design at the Rose Polytechnic Institute at Terre Haut, Indiana; in 1888 I went to Dallas, Texas, practicing general engineering in Texas and Okla-

homa until 1892; in 1892 I worked one year as chief engineer of steam engine manufacture in Erie, Pennsylvania; in 1893 and 1894 I was chief salesman engineer of the Risdon Iron Works of San Francisco. From 1894 to 1896 had an office of my own in San Francisco, California, designing mining machinery, water power plants, and making tests and measurements connected with such lines of business. From 1896 to 1900 I was senior member of the firm of Cobb and Hesselmeyer, mechanical and hydraulic engineers, in San Francisco, doing business with some of the largest installations and in some of the original installations in hydraulic work installed in the State of California. From 1900 to 1901 I was consulting engineer at Los Angeles, California, doing a general consulting business in mechanical and hydraulic subjects.

Q. 3. By Mr. Westall: Have you ever testified as an expert in patent causes?

A. In a great many of them, in Massachusetts, in Texas and California.

Q. 4. I now call your attention to Complainant's Exhibit HH purporting to be a certified copy of the Lyndon Patent, No. 695220, and ask you to state if you have examined said patent and if you understand the device therein shown and described?

A. I have read the patent through and endeavored to familiarize myself with the details of construction, and feel that I understand the objects and aims to be accomplished by the mechanism therein shown. I am not an expert in electrical matters and have to

assume that statements made with reference thereto in the patent are correct. The general desire of and object covered by this patent, I understand.

Q. 5. Please describe the device you find forming the subject matter of the specifications, and illustrated in the drawings of said Lyndon Patent No. 695220, freeing the subject as far as possible from technical terms. Explain the theory, as you understand it, upon which the Lyndon patent was working, the objects aimed at, the results sought to be accomplished, stating fully your reasons for any opinions you may express.

A. From reading the text of the Lyndon patent one learns that the object of this device was to so control the gates of a water-wheel and so control a by-pass for water leading from the main penstock, that regardless of the quantity of water being used to perform useful work in the water-wheel at any instant, a constant flow of water should be maintained in the penstock, and the idea being of such mechanism to overcome a difficulty which had been recognized in practice at that time, caused by the flow of water in the penstock acting somewhat as follows when the quantity was increased or decreased that was supplied to the wheels: If a water-wheel is operating under a given normal condition and the load it was required to drive or handle was very suddenly increased or decreased, then the mechanism has been arranged to close or open the gate supplying water to the water-wheels in order that they might

have sufficient energy imparted to them to overcome the increased load, or sufficient energy taken from them to balance the decrease of load. Under such circumstances as this, and having in mind the stored energy of the flowing water in the penstock, when a gate was closed at the water-wheel the action on the water was to momentarily increase the velocity of the water discharging through said gates, if they were partially closed. Vice versa, if the controlling mechanism of the water-wheel were opened with the intention of bringing more water to act upon the wheel, the pressure of that water would be momentarily decreased because of the inertia of the flowing water in the penstock. The object of the device shown in this patent is to overcome that difficulty, which was a recognized difficulty in the controlling of water-wheels to maintain uniform speed under all conditions of load, without too great a variation of speed when those loads were changed. The patent in question shows a penstock for bringing water to a water-wheel; it shows a by-pass, the discharge from which may be partially controlled, and it shows mechanism for operating the gates to the water-wheel, the mechanism for operating the gates of the water-wheel and for operating the discharge opening of the by-pass being operated coincidentally and by a change of speed in the load driven by the water-wheel. Provision has been made in the device shown for overcoming any tendency of the water-wheel to continue to increase in speed beyond the point desired when water is supplied to it, and also provision

for overcoming its tendency to decrease in speed beyond a point desired when water is cut off from the wheel. The language of the patent covers this statement of the case, and Claims 6 and 7 indicate to my mind the strong points of the device. From my knowledge of the state of the art at about the time that this patent was issued, I know for a certainty the objects aimed at by this application were also the objects aimed at by many engineers working along on these lines. That is to say, the demand for devices of this kind was recognized and was the subject of studied efforts and experiments in order to obtain proper action in water-wheels to correspond with the demands for electrical generators which received their initial energy from water-wheel operation.

Q. 6. Has your experience been such as to familiarize you with the state of the water-wheel-governing art prior to September 13, 1900, the date of the Lyndon application?

Mr. Blakeslee: Objected to as calling for a conclusion on the part of the witness and not calling for a statement of what experience the witness has had, if any.

A. It has.

Q. 7. By Mr. Westall: Will you state specifically what experience you had had with water-wheel governors prior to the 13th of September, 1900, which would qualify you to speak authoritatively as to the state of the art at that period.

Mr. Blakeslee: We object to the question as lead-

ing and calling for a conclusion and not calling for a full statement of what the experience of the witness was.

A. When I was acting as engineer for the Risdon Iron Works, as before stated, from 1893 to 1894, I came in contact with a number of water-wheel installations used for hoisting at mines and for driving pumps, and became acquainted with the condition of the art at that time as exemplified by the practice of the Risdon Iron Works in the installation of water-wheels, of the Pelton Water Wheel Company of San Francisco, and of a wheel known as the Dodds water-wheel, also manufactured in San Francisco; and after I opened an office of my own in 1894, through clients who came to my office for assistance in engineering matters, I became very steadily employed in the designing and installation of such classes of works. One installation in particular, which applies, perhaps, as well as any to this case, was at The North Star Mines in Grass Valley some time about the year 1897, I think. The problem there was to drive a certain water-wheel at a constant speed regardless of the amount of work being done by the waterwheel and regardless of the fluctuations in pressure occurring in the penstock supplying water to this water-wheel. The peculiarities of the location were such that the same penstock, some seven miles long that supplied water to this water-wheel installation, also supplied water to several other water-wheel installations, some of them used for operating mine hoists, and wherein the power was many

times during the day suddenly shut off and on. The result at the lower end of the penstock, where the installation in question was being installed, was a very material variation in pressure, these variations occurring oftentimes suddenly and at all periods during the day and during the operation of the wheel. To overcome the difficulties that were presented, I designed a special nozzle for supplying water to the water-wheel and a special governor for operating the nozzle and a special device upon the pipe line for regulating, so far as possible, the pressures within that pipe line or penstock near the location of the water-wheel. So far as my knowledge of the practice in the mountains was at that time the adjustable nozzle that I applied to that water-wheel was recognized as the first successful one in operation. The governor that was designed to control this nozzle, if you will pardon me for saying it, was of such design that the builders required the purchaser to pay for it before it was shipped, because no faith was put in the fact that such a governor could be constructed. This governor was intended to maintain the wheel at constant speed regardless of the load on the wheel, and it operated to do that in a most acceptable manner and did it by controlling the area of cross-section of the nozzle supplying water to the wheel. The fluctuations of pressure in the pipe line due to causes hereinbefore mentioned was regulated within approximately three pounds of pressure out of 335 pounds normal pressure, by a specially arranged air-chamber having discharge openings con-

trolled by safety valves, the whole being so arranged that any increase of pressure above that which was considered as normal pressure occurring in the penstock would be absorbed by the air-chamber, and any rebounding action of the air-chamber prevented from operating to fluctuate the pressure in the penstock, and the surplus water thus entrapped in the air-chamber was discharged through the regulating valves previously mentioned. That whole installation worked in a satisfactory manner.

The next opportunity that was presented to me for the study of problems similar to the one involved, was the installation of water-wheels for the Power Development Company at the foot of the Kern River Canyon, about fifteen miles northeast of the city of Bakersfield. This installation was started in 1896 and was subjected to tests for acceptance in 1897. The object of this installation was to supply water-power for operating electrical generators; and, as these generators were to supply both power and light to the city of Bakersfield, it was considered necessary that they have very close regulation for speed. Several corporations presented schemes for accomplishing the results that the Power Development Company required, but after consideration they concluded to adopt the scheme presented by the Girard Water Wheel Company, so-called, of San Francisco, who were, so far as I know, at that time just starting in business. They presented a power unit for operating the generators consisting of two so-called Girard Water-wheels to which the water

was supplied by a number of nozzles, each having an adjustable orifice for discharging water into the wheel body. In the particular unit under discussion there were two such wheels on a single driving shaft. This driving shaft was not connected directly to the driving shaft of the electric generator, but was connected to the driving shaft of the electric generators through a system of links, the object of which was to use the constrained motion of these links as a means for operating the nozzles and controlling the quantity of water supplied to the wheels in proportion to the load of the generator, and also to so control the supply of water to the wheels that the speed of the generator should be constant or as nearly so as was practically possible. And, on account of the large body of water involved in the operation of these wheels, because of the fact that they had a comparatively low head, it was deemed advisable to introduce a by-pass in the penstock for the purpose of discharging from the penstock such water as was not used upon the wheels.

Q. 8. By Mr. Westall: Now, during the time that you were employed in and about these various installations which you have described, state whether or not you made any special study of water-wheel governors which were then in use.

A. Yes. I was acquainted at that time with the water-wheel generators in use in California. The common method, where the water supply was ample, was to use what was called a deflecting nozzle. That is to say, the nozzle supplying the water to the wheel

could be swung about a center so that the stream from the nozzle would impinge to a greater or less extent upon the buckets of a tangential water-wheel. That was a very common method of handling the load throughout the mining country. It was not found very accurate for handling electrical loads, for getting real good uniform speed. Then the Pelton Water Wheel Company introduced the idea of having several nozzles play upon the buckets of a tangential water-wheel, and sometimes they provided on one of these nozzles, and frequently on all of them, a sort of a sliding hood that would pass over the ends of the nozzles to determine the quantity of water discharged. They also devised another form of deflector for the water discharged from the nozzle which acted to deflect the water from acting on the wheel after it had left the nozzle, which was otherwise fully wide open. This device acted correctly in that it did not, by reason of changing the quantity of water striking the wheel, change the flow in the penstock. The device was controlled by a governor composed of two elements, one of which was a constant speed motor or as near a constant speed motor as could be driven from the water supply. This little constant speed motor was provided with an exceedingly heavy fly-wheel in proportion to the quantity of water supplied to its water-wheel; and then there was connected to the water-wheel shaft a special governor of the well-known fly-ball type which, acting through differential gearing in connection with the constant speed motor, gave a means of operating the water-wheel gates and which

was at that time a very satisfactory proposition. But in the case of the proposition that I mentioned as being installed in Grass Valley, the wheel then was to drive an air compressor, and it was essential that this air compressor would operate in such a manner as to maintain at all times a constant pressure of air in a certain air receiver from which the air was taken to operate the machinery of a large mine, including pumps, hoisting engines and the like, being a very intermittent demand for compressed air. It was also essential that the wheel should use just as little water as possible in doing the work. Consequently, the compressor was so designed that it would only compress the exact quantity of air required to maintain the pressure in the above mentioned receiver, while the main shaft was driven at all times at a uniform rate of revolution. Then for constructing a given compressor to fill those conditions, we had the fly-ball governor to take care of any variation of speed which might occur in the shaft of the compressor, and we had an auxiliary cylinder operating in this case, the piston of which was moved by any variation of air pressure in the air receiver. This cylinder, and this piston, operating by the air pressure in the air receiver, was similar in its results or similar in its action upon the remaining portions of the governor in many respects to the constant speed motor that I have previously mentioned as being common in some of the Pelton water-wheel installations. But it was necessary, at all events, in the Grass Valley installation, that two

things should operate on the governor: one, any change in speed; another, any change in the pressure of air maintained in the receiver. Also about this period S. N. Knight of Knight & Company, Sutter Creek, California, was doing pioneer work in water-wheel installation, and he devised governors for controlling the supply of water to wheels dependent for their action upon the change of speed, which in turn, operated the gates of the water-wheels. His field of activity was more in connection with mining work and I don't recall at this time any installation that he put in in those years for the operation of electric-lighting plants. I think some years later he took up the question of lighting plants, but not at this time. My business was such that I was running around all over the country and I saw, probably, as much of what was going on in those days as anybody in the business in this state. The subject of water-wheel regulation at that time was a live subject, and it was anticipated that in years to come it was going to cut a great swath in the production of electricity, and the electrical engineers made a very great strong point of the fact that they must have uniform speeds under all conditions.

Q. 9. About what time are you speaking of now?

A. The years from 1893 to the time I left there in 1900, all the time.

Q. 10. Was there any particular locality in the United States that was further advanced, to your

knowledge, in water-wheel-governing means than any other part, or, I might say, where the subject was given greater attention?

Mr. Blakeslee: Objected to as leading and calling for a conclusion.

A. From my knowledge of the state of the art during the years mentioned, the subject, as I have before stated, was a live one in California; and, owing to the fact that the heads of water and the pressures of water to be dealt with, and the small quantities in proportion to be dealt with, it made the subject of water regulation almost belonging, under those conditions, to this State. The eastern part of the United States had not, to my knowledge, at that time developed any what we call high heads. There were lots of heads of water in evidence where I was raised, 20 to 30 foot heads, and a 40-foot head was very rare; and the type of wheels we used were large wheels using large quantities of water under low heads, and they were used prior to the time of the introduction of electric-lighting, and strictly for driving industrial plants, and their regulation was sufficient at that time for that purpose. But the handling of water under high heads introduced many other peculiar conditions, and, especially, where the water was brought to the wheel in long conduits or long penstocks, as they are sometimes called—but long pipe-lines is the real name. In the New England practice the water to the turbine wheels was taken from canals through penstocks of large diameter for handling large quantities of wa-

ter at low velocity, as a general rule, whereas in California the conditions were such that we had comparatively small quantities of water under extremely high heads. This introduced a terrific spouting velocity and made the problems governing the speed of water-wheels entirely different, practically, from those which had been found to prevail from the use of low heads for turbine water-wheels. Consequently, I fully believe that it is a fact that California, as a country, and the Swiss people, were the ones most alive to the question of governing water-wheels under high heads of water. The Swiss, I knew in those years, were working on the problem, and I saw at those times and along in the year 1898, I think, several articles in the technical journals which had been translated, I presume, from the Swiss articles, and they were credited to this Escher-Wyss Corporation whose name I heard this morning in connection with one of the patents. I recognize that as being the name of one of the progressive corporations of Switzerland interested in the same problems that we were studying in California in those years. Since I left San Francisco in 1900 to take up my residence in Los Angeles, I have not had anything like the contact with these hydraulic questions that I had prior to that time, and at this time am not so well acquainted with the latest devices used. But at the dates I mentioned above, from 1893 to 1900, I was in the business and alive to its requirements, and, if I do say it myself, did some pioneer work in obtaining results.

Q. 11. By Mr. Westall: State whether or not at that time you kept in touch with the development of the art through magazines and periodicals and other methods of communication?

Mr. Blakeslee: Objected to as leading, and suggestive and calling for a conclusion.

A. I did not. My work was almost all on the side of being actually on the job. I did not study the magazines at all, and it was only special articles that I ever saw, once in a while. I know no condition of affairs except as they were brought to me specially.

Q. 12. By Mr. Westall: How would the installations which you have mentioned in your previous testimony compare in size and importance with other installations at that time in California, if you know?

Mr. Blakeslee: Objected to as calling for a conclusion.

A. The installation at Bakersfield was for 3,000 horse power. Two installations at Grass Valley, the first one, I think, was for something like 250 horse power and the last for 335 horse power. The exact powers of those can be obtained. And about those dates the original plants were being put in east of Fresno. I did the mathematical work for the construction of the penstock on that line and I don't remember what the output of power was, but the head of water under consideration was over a thousand feet. The head of water on the Grass Valley plant was 775 feet and the head of water on the Bakersfield plant was above 200 feet—200 or 220, or some-

thing like that—and down the Mother Lode country there were heads of water in the Blue Lake plant in the Mokelumne River of 250 feet. I had to do with the plants at the Canada Mine near Jackson, and also the Keystone Mine at Amador, but the heads and powers I do not remember particularly. At that time I knew who was using every cubic foot of water that ran through the Blue Lakes water system, and if it is essential to this case I could produce the figures. But I do not recall them now. But they were most all used on water-wheels, except such little supply of water as was necessary for domestic use for the towns of Amador, Sutter Creek, Jackson, and so forth, on Mokelumne Hill.

Q. 13. By Mr. Westall: I now call your attention to a sentence beginning at line 8, page 1 of the specifications of the Lyndon patent, No. 695220, reading: "The governors at present employed to regulate the water supply to the water-wheel in general simply operate to open and close the water-gate, thereby allowing the admission of a greater or less supply of water", and ask you to state whether or not that is a true statement of the development of water-wheel governing art at the time of the Lyndon application on September 13, 1900?

Mr. Blakeslee: Objected to as calling for a conclusion.

A. There was in use prior to this date water-wheel governors which operated not only to open and close the water-gate, but also to regulate the flow of water in the penstock at all times, regardless

of the quantity of water flowing through the gate.

Mr. Blakeslee: We object to this answer and ask that it be stricken from the record as not responsive to the question.

Q. 14. By Mr. Westall: I will ask the witness to amplify the answer, explaining fully the devices which, in his opinion, would make the statement read inaccurate, if I have correctly understood the answer.

Mr. Blakeslee: Objected to as leading and suggestive, and calling for a conclusion and not for a statement of such facts as the witness may know pertinent to the conditions at the time inquired of.

A. Prior to the date of the patent of which the quotation has just been made, there was in use in California a power plant wherein the governor was employed to regulate the water supply to the water-wheel and also to regulate the supply of water discharged from the penstock, the operation of both of which maintained a constant or steady flow of water in the penstock. Such an installation, to my personal knowledge, was in operation prior to August, 1897.

(At this point an adjournment is taken until 2 o'clock P. M. of this day at the same place.)

Wednesday, April 1, 1914, 2 o'clock P. M.

This being the time and place to which the taking of proofs on behalf of defendant was continued, proceedings are now resumed.

Present:

Raymond Ives Blakeslee, Esq., solicitor for
Complainant.

Joseph F. Westall, Esq., solicitor for Defendant.

EDWARD S. COBB, recalled.

DIRECT EXAMINATION (Resumed)

By Mr. Westall:

Q. 15. I now call your attention to line 88, page 4, of the Lyndon patent in suit, reading: "It is here to be noted that all water-wheel governors as made today must accomplish their governing only at such speed as the acceleration or retardation of the water in the column of the pipe can be accomplished, whereas in the action of the governor herein described with the compensation gate and actuating apparatus, the time element is removed from the main gate and the water-wheel and taken care of in the by-pass", and ask you to state whether or not such language is a correct and accurate statement of the development of the art at the time of the Lyndon application, September 13, 1900?

Mr. Blakeslee: Objected to as calling for a conclusion on the part of the witness.

A. It is not a correct statement, because prior to that time there had been water-wheels constructed wherein the governor and compensating gate and actuating device and gates of the wheels had been in use, together with a by-pass in the conduit leading to the wheel.

Q. 16. By Mr. Westall. From your knowledge of the history of the art prior to the Lyndon application, I will ask you to state what, if anything, in

your opinion, was added to the art by the Lyndon patent in suit?

Mr. Blakeslee: Objected to as last stated of record.

A. Nothing.

Q. By Mr. Westall: Is there anything new with Lyndon in providing, as stated by him in line 28, page 1, of the specifications, of the Lyndon patent in suit, "a by-pass inserted into the penstock or flume at a point near the water-gate, and a gate in the said by-pass controlled by the same governing mechanism that controls the water-gate, and operating to allow a greater or less flow through the by-pass according as the water-gate is being closed or opened."

Mr. Blakeslee: The same objection.

A. No; there is nothing new in that statement. There was nothing new in that statement at the time and date that it was made.

Q. 18. By Mr. Westall: When and where did you ever see or hear of the use of a by-pass provided with a valve to maintain a uniform pressure in the pipe-line and prevent water-ram prior to the date of the Lyndon application?

Mr. Blakeslee: Objected to as leading and as assuming a fact not testified to by the witness.

A. I saw the drawings for such a device prior to, I believe, September, 1896. I reported on the probable results of the use of such a device sometime during the summer of 1896, the date of which can be supplied, and saw water-wheels operating with such a device in use successfully many times prior to Au-

gust, 1897, at the power plant of the Power Development Company approximately fifteen miles east of Bakersfield, California.

Q. 19. By Mr. Westall: Prior to the date of the Lyndon application, September 13, 1900, have you seen any apparatus embodying a governor construction combined with a water-gate and by-pass, wherein the by-pass and water-gate under the control of the governor operated inversely each with respect to the other?

Mr. Blakeslee: Objected to as leading.

A. Yes, sir.

By Mr. Westall: Counsel for defendant calls attention that he is simply quoting a question asked by Complainant of the witness Henry in leading up to the alleged infringement, and that if the question is leading now it must have been leading when asked of the witness Henry.

Mr. Blakeslee: We will supplement the objection by the further objection that no foundation has been laid for the question.

Q. 20. By Mr. Westall: Please state when and where you saw such an apparatus as described in the last question.

A. I saw such an apparatus prior to August, 1897, in operation in the power house of the Power Development Company, fifteen miles east of Bakersfield, California.

Q. 21. What was the Power Development Company? A corporation?

A. The Power Development Company, as I now

think, was a corporation formed under the laws of the State of California, for generating electric currents by the use of water from the Kern River to supply power and lights to Bakersfield and vicinity.

Q. 22. And who were the principal officers, if you know, during the time that you speak of?

A. As I remember it, Charles Webb Howard, of San Francisco, was President, and Lloyd Tevis was a heavy stockholder. Carroll N. Beal was secretary and manager.

Q. 23. In what manner did you gain the knowledge that you have testified to as to the construction and operation of water-wheel governors in use in that plant?

A. I was the original hydraulic engineer of the Power Development Company.

Q. 24. For how long a period?

A. Off and on, whenever any questions arose in my line, from the time they started their work until I moved to Los Angeles in 1900. I think I went there on one trip since then. I am not sure of that. That is a matter that I can look up, if necessary. But, anyway, from the time they started and conceived the idea, which must have been somewhere about the latter part of 1895.

Q. 25. What part, if any, did you take in the designing and installation and construction of the plant which you have spoken of as being used by the Power Development Company at Bakersfield, at the time you have mentioned,—1896 and 1897.

Mr. Blakeslee: Objected to as leading and assuming facts not testified to by the witness.

A. My first work with that, as I now remember it, was to determine in connection with the civil engineer employed by them as to the best location for the pipe line leading from the intake from the flume down the mountain side to the power house. Also, to determine the diameter of that pipe and its thickness, material and method of construction. A draughtsman under Mr. Beal, the manager, and directly under him, drew up tentative plans for a power house and its contents, with a view to having a proposition submitted to them by different water-wheel manufacturers and machinery supply houses, for equipping the power plant according to these tentative plans. In answer to his request that they submit propositions for water-wheels, etc., he received a proposition from the Risdon Iron Works for the installation of a power unit, and from the Pelton Water Wheel Company, and from the Girard Water Wheel Company, and those tenders on their part were made some time in the summer of 1896, I believe. That date I can fix, but right at this moment it is out of my mind. In behalf of the Power Development Company I went over the different propositions made by these corporations, and recommended that the Power Development Company take up with the proposition of the Girard Water Wheel Company, which they did after my report, and my report was written to them in the summer of 1896.

I can fix that date in two minutes by referring to my notebooks.

Q. 26. By Mr. Westall: Will you please refer to your notebook, if you have one, and verify the date which you have mentioned.

A. The report that I made to them, above referred to, is dated August 8, 1896.

Q. 27. You have referred to a draughtsman.

A. The draughtsman I have referred to as being employed by Mr. Beal to draw up tentative plans was simply a draughtsman who drew up the general plan for the power house and general lay-out of the pipe line and general plans and sketches, as would be required by parties desiring to make a bid for complete installation on their own plans. His plan was simply illustrative of the position, but the plans of the contractors were finally to be used in the installation.

Q. 28. Have you the original or a copy of the report that you made at the time mentioned?

A. I have the office copy of the report that I made August 8, 1896.

Q. 29. Could you produce that office copy?

A. I wish to say, Mr. Westall, that these reports, if they are used here, I should like to make proper arrangements for in advance that they be returned, as they are part of my stock in trade and I don't want to leave them tied up in the archives of the court indefinitely.

Mr. Westall: I think some kind of an arrangement can be made to permit you to withdraw them.

(The witness produces a document marked "Report on Wheels of the Power Development Company, San Francisco, California, C. N. Beal, Secretary, August 8, 1896," having the signature "Edward S. Cobb" indorsed on the back.)

Mr. Westall: I will not introduce that just yet.

Mr. Blakeslee: It is noted that although this report is said to be produced, it is not offered in evidence and not submitted to the inspection of counsel for the Complainant.

Q. 30. By Mr. Westall: Will you please state briefly your reasons for recommending the selection of the Girard governor, which you have mentioned, by the Power Development Company?

A. As I recall at this time those reasons, without having read any of the report I made at that time on the subject, they were first considering the fact that they had comparatively a low head of water for tangential wheel operations. I believe that the Girard type of wheel was better adapted to that use. The Girard wheel, as constructed at that time, consisted of an annulus of buckets which revolved around the outside of the nozzles supplying water thereto, and the water was discharged from the periphery of the annulus containing the buckets.

The Girard people, moreover, submitted a scheme for regulating the speed which appealed to me as being theoretically the most perfect scheme that I had seen at that time for the regulation of water-wheels. It embodied the weighing of the load on the electric generator between the generator itself

and the shaft of the water-wheels supplying power thereto, and it was evident to me that any change of load was a quicker indication, or, if it could be used to operate water-wheel gates, would be a quicker and more sensitive means for operating the gate than if we had to wait a length of time for speed to change. The Girard people submitted a governor which in one construction contained a great many desirable elements. In the first place, it weighed the load being carried by the water-wheel, and it assumed a position in proportion to that load,—a fixed position for every different load. At the same time, it acted as the finest speed regulator that I had at that date seen on a water-wheel, and it contained within its methods of construction and operation all the requirements to prevent over-run of the wheel. The construction was simple and did not contain small parts liable to get readily out of order, so far as the governing and gate-controlling mechanism was concerned. For that and probably many other reasons I recommended that they take the Girard wheel.

Q. 31. Did you embody those reasons, or any of them, in the report which you have heretofore mentioned as having been made at that time?

A. In the report that I made at that time I discussed all the propositions that were made to the Power Development Company by the different bidders and gave my reasons for their discarding or setting aside the suggestions of each one of them, and also reasons for recommending the Girard

wheel, all of which is in the report that I have recently passed to you.

Q. 32. Please describe, in a general way, without going too deeply in the technicalities of the subject, the principle and method of operation of that Girard governor.

Mr. Blakeslee: Our general objection previously noted as to the testimony by this witness or any other witness, or as to any evidence to be adduced or attempted to be adduced in connection with any such testimony bearing upon this alleged Girard device or any other device prior to the date of the application for the Lyndon patent in suit, save and except with respect to the matters and things set up in the answer or which may have been set up in the answer or are purported to have been set up in the answer in the suit are concerned, is hereby repeated, and the attention of the court is called to the fact that this witness is testifying as to things entirely without the pleadings, and, therefore, irrelevant, incompetent and immaterial. The further objection is made that the testimony of the present witness is not the best evidence as to the purported devices or statements which are now under consideration by him; and we shall move to strike from the record and withhold from consideration in this case any and all testimony and evidence bearing upon such irrelevant, incompetent and immaterial statements and subjects, and such things and subjects as fall without the pleadings in this case.

Mr. Westall: Counsel for Defendant simply sug-

gests that the objection of counsel brings out very clearly an inconsistent position taken in the case. Counsel on one hand is insisting upon having testimony taken within the time allowed by the court, and, on the other hand, is interposing objections which, if regarded, would make it necessary to postpone the taking of any testimony until after the court had passed upon the motion to amend in this case. It is an absolute impossibility to have an order entered upon the motion to amend, in view of the congested condition of the calendar at the present time. And attention is also called to the fact that counsel for Complainant himself suggested that the motion be continued for two weeks, last Monday, when it came up for hearing. Now, either counsel for Complainant has no real desire to expedite the case or he is seeking to make it impossible for the Defendant to put in the evidence as required by the stipulation.

Mr. Blakeslee: I think that the court will read through the charge of inconsistency made against counsel for Complainant, the lack of diligence chargeable to the Defendant in presenting his said motion for leave to amend the answer. It is now over six weeks since Complainant closed an elaborate and expensive *prima facie* case, and the said motion was not introduced on a date earlier than the 30th day of March, namely, two days ago. When this motion was continued two days ago, it is true that counsel requested it to go over two weeks, as another matter which counsel who represents the Complainant was engaged in was continued over for

one week, and which is an urgent matter and takes precedence, in his opinion, as to importance over the matter of the motion referred to, but in view of the tardy procedure in presenting that motion, it is now some four months since the answer was interposed in this present suit, and counsel for the Complainant is willing to leave to the court without further comment the determination whether counsel for Complainant is unfairly charging the Defendant with lack of diligence in respect to this present motion, and whether he is not entirely within his rights in insisting that the proofs on behalf of the Defendant in this case be confined within the limits of the present pleadings.

A. The Girard governor consisted of a reasonably heavy fly-wheel with a heavy rim provided for the purpose of aiding the rotating energy of the electric generator, which fly-wheel was attached to the shaft of the electrical generator. Within the outlines of the fly-wheel—in fact, within the rim of the fly-wheel—there were attached two levers to pins diametrically opposite one another, these levers in operation remaining practically parallel to one another in all positions and lying as long chords across the fly-wheel. Attached to these levers were short links, free to swing about pins passing through the levers. These short links at their other extremities engaged with pins which were respectively in each end of a double crank-arm. This double crank-arm was keyed solid on the water-wheel shaft, and the water-wheel shaft was concentric and in line

with the electric generator shaft, and centered practically perfect with the center of the fly-wheel before mentioned. These levers were further connected by means of two heavy steel coil springs which were adjustable in regard to their tension and also adjustable, within limits, in regard to their position on the levers, particularly in reference to their distance from the pins on which these levers were hung. Also on these levers there were provided weights that could be moved back and forth on that end of the lever farthest from the point of attachment to the wheel. The dimensions and design were such that the total motion of the extreme ends of these levers was a few inches only—I think about 4 inches. When the springs referred to were adjusted for a certain initial tension, just sufficient to prevent centrifugal force from throwing the levers out when the wheel and generator were running at full speed, and no load, that was considered a normal position for the springs. But the springs had been designed for such dimensions both with respect to diameter of wire used and pitch and diameter of coil, that by previous tests it was known what tension they would exert between the levers referred to. When those levers were separated to some extent, or in other words, when the spring was extended to the various distances, that is to say, if the spring in its normal position with no load was of a certain length and had in its coils at that time a tension of, say 300 pounds, we knew from an exact test on the springs that if they were increased in length, say

4 inches, that the tension would increase to, say, a thousand pounds. Now then, if power be applied to the power wheel it would first act to revolve the double-ended crank-arm mentioned, and through the short links mentioned would act to close the levers mentioned down to their nearest position possible for them to take to the center of the wheel. And as motion was imparted to this device, the centrifugal force acting against the levers, due to their weight and to any added weight previously mentioned which might have been added, would tend to throw the levers outward away from the center of the wheel. If the generator attached to these levers by means of the fly-wheel above ^{specified} ~~mentioned~~ offered resistance to the revolutions, it had a tendency also to prevent the outward throw of the levers just mentioned due to centrifugal force. The whole construction in this way acted as a transmission dynamometer, and by proper calibration it could be shown that the position of the lever in the wheel would be a measure of the power being transmitted from the water-wheel shaft to a generator shaft, all the necessary calibrations of the springs and levers having been previously properly made. The fact that this mechanism did measure the load in that manner was one of the superior elements entering into its governing device. Whenever the water-wheel shaft was transmitting a given amount of power within the limits of the wheel, these levers assumed a definite position with reference to the wheel within which they were enclosed. That primarily

was due to its action as a dynamometer or as a measure of the load being transmitted. And when the dynamometer action was correct, the lever at that time was in perfect balance in the wheel. That is to say, there was just as much tendency for the lever to jump towards the center of the wheel, due to any other force than load acting upon it, as there was for it to pump outward toward the circumference of the wheel. Now then, if any other force than simply power transmitted was introduced, then this lever would change its positions. And the other force that we have in mind is the additional centrifugal force which would be brought to bear in the lever with an increase of speed, or the additional centrifugal force which would be brought into the lever by the decrease of speed in conjunction with the spring above mentioned. Consequently, the levers first, by their position, were a means of determining the load carried or, to make it more clear, for a given position there was a given load passing through them. And, for any such given position, they were floating. That is to say, balance with respect to the force of transmitted power passing through them. But any increase of speed of revolution or decrease of speed of revolution would cause them to instantaneously change position by reason of the increase or decrease in the centrifugal force acting therein. Consequently, in that way they became speed governors and were capable of regulating the speed with which the parts revolved, to the greatest nicety, which at that period was expected

in water-wheels. These levers also had connected to them by means of suitable links bell-crank levers, which, in turn, would move toward and from the hub of the double crank-arm a collar on the wheel shaft. This collar revolved at all times with the water-wheel shaft, but was free to move longitudinally thereon. Surrounding this collar and embodied in a circular groove therein, was another collar which did not revolve but fitted freely within its groove on the collar which was free to move longitudinally. Attached to this latter collar was a forked lever pivoted at a point below the shaft to a support on the water-wheel case, and the lower end of the lever was connected to a rod which passed through under the water-wheel and engaged one arm of the bell-crank. The other arm of the bell-crank was attached to a floating bar whose opposite end was attached by means of suitable linkage to the piston of a hydraulic cylinder. Between the two mentioned extremities of this floating lever there was attached in a proper manner the stem of a balance line to the line-slide thereof, the purpose of which was to allow the introduction of water or oil under pressure into before-mentioned hydraulic cylinder for the purpose of causing its piston to move in one direction or the other according to the position taken by the above-mentioned balance line to the line-valve. The piston rod of this hydraulic cylinder was perforated at its outer end with a cross-head guide, and on the upper side of the cross-head was connected to a lever which rotated about the center of the water-wheel

shaft. Forward of this connection it was connected by means of a rod to the crank-arm of a cylindrical by-pass valve which was introduced into the branch from the penstock between the main body thereof and the gates supplying water to the water-wheels. The lever above-mentioned as having motion about the shaft of the water-wheel, was so formed about that shaft as to represent a long cylinder, to one extremity of which was attached by means of suitable links the several stems of the water-wheel gates for one of the unit water-wheels, and at the other end of the cylinder similar connections to the other unit water-wheels, the result being this: that any change of position of the collar that could move longitudinally on the water-wheel shaft first gave a new position to the balance line to the line-valve above mentioned. This new position of the line to the line-valve would allow water or oil under pressure to enter at one side of the piston enclosed in the hydraulic cylinder, and any liquid in the opposite side of the piston to escape. The motion of the piston thus started would be transferred first to the opposite end of the floating bar or lever above mentioned and would tend to draw the balance line to the line-valve back to a position that it had just been moved from. At the same time, the forward motion of this piston would move all the gates attached to the water-wheel and also the by-pass from the penstock to the tail-race. The governor thus, I believe, has been shown by this description to have control absolutely, which I know it did in practice,

of the position of the gates of the water-wheel and the position of the gate in the by-pass automatically and quickly and effectively.

Q. 33. By Mr. Westall: In actual practice did that device fulfill your ideas of its effectiveness?

Mr. Blakeslee: Objected to as calling for a conclusions and not for testimony as to what it actually did.

A. The device was, as I have previously stated, considered by myself and the owners about as perfect a water-wheel governor as was then known, and the installation, so far as the governing of the water-wheel was concerned, was a perfectly satisfactory installation.

Q. 34. By Mr. Westall: Referring now to the report heretofore produced by you, endorsed "Report on Water Wheels for the Power Development Company, San Francisco, California, C. N. Beal, Secretary, August 8, 1896", I will ask you to state whether or not that report was sent to the Power Development Company at or about the date it bears—August 7, 1896?

Mr. Blakeslee: Objected to as irrelevant, immaterial incompetent and not tending to prove any issue properly raised by the pleadings in this case. And it is understood that the objections heretofore noted with respect to any and all matters not within the pleadings in the case, such as this alleged Girard governor, are registered with reference to each and every question which has been and which may be hereafter put with respect to any such unpleaded

matters and matters not raised in and by the answer, without the necessity of in each and every question specifically interposing such objection; and the same motion heretofore made to strike from the record and withhold from consideration all such matters as without the pleadings, likewise is understood to be repeated with respect to each and every part of the testimony of this and every other witness to which it applies.

Q. 35. By Mr. Westall: Whose signature is that appended to this report?

A. That is the signature of Cobb & Hesselmeyer by myself.

Mr. Blakeslee: Objected to as not the proper method of proof.

Mr. Westall: Counsel for the defendant offers in evidence the report referred to and ask that it be received in evidence and marked as "Defendant's Exhibit Cobb & Hesselmeyer Report of August 8, 1896."

Mr. Blakeslee: The offer of this paper is objected to on the ground it is irrelevant, immaterial, incompetent, and not tending to prove any issue raised by the pleadings in this case, and as not properly proven, and that it is not the best evidence of the matters concerned therein.

(The said Report so offered in evidence is marked "Defendant's Exhibit Cobb & Hesselmeyer Report of August 8, 1896", together with the title of the court and cause and the date of the offer of the said report in evidence.)

Q. 36. By Mr. Westall: Can you produce any pic-

tures or photographs of the plants that you have described in your previous answer?

Mr. Blakeslee: The same objection.

A. Yes, sir.

Q. 37. By Mr. Westall: Will you produce that photograph?

A. I have in my hand here a photograph showing the general interior view of the plant of the Power Development Company previously referred to.

Q. 38. Where did you get that photograph?

A. It was given to me by the owners of the plant at the time I was finishing up the installation.

Q. 39. At what date?

A. It must have been about 1897, because I have never been in the plant since.

Q. 40. Were you present at the time the picture was taken?

A. I was not.

Q. 41. Do you recognize in the representation there a correct picture of the Power Development Company plant that you have testified about?

Mr. Blakeslee: Objected to as calling for a conclusion and that it is not the proper method of proof and not the best evidence and not the proper method of identification of the photograph.

A. Yes.

Q. 42. By Mr. Westall: Do you recognize either of the persons represented in said photograph?

A. There are four persons shown in the photograph here. One in front of the switchboard whose name escapes me just at this moment, but which I can supply

if necessary. Another one sitting on the corner of the electric generator is Wirt Macmurdo, the civil engineer, employed on the general lay-out. Sitting on the corner of the water-wheel base is Mr. Berry, the designer of the mechanism. Lying on the floor is John Smalley who was the foreman of the Lacy Manufacturing Company in the installation of the penstock work up to the main operating gate. The photograph shows the interior of the power house after two of the main units had been installed, and shows the foundation bolts which at that time stood in the floor in anticipation of the addition of further units.

Q. 43. Can you state at about what time that photograph was taken?

A. That photograph must have been taken, by reason of the presence of the three men in it, especially Smalley, just immediately after the installation was ready to start.

Q. 44. And about what date?

A. It must have been prior to—it may have been several months prior, but it was certainly prior to August, 1897, to my certain knowledge.

Q. 45. What means have you for determining the date?

A. Because under a date of August, 1897, I made a report on the operation of this plant after it had been subjected to some tests and the original of that report was submitted to the Power Development Company.

Q. 46. That is not the report you have heretofore referred to?

A. No. That report was made before anything was

purchased to put in the plant. It was a year prior to this time.

Q. 47. You have pointed out Mr. Berry. Is that Mr. S. L. Berry?

Mr. Blakeslee: Objected to as leading.

A. I don't remember his initials. I always knew him as simply "Berry". I would not attempt to remember his initials. I would know him if I saw him mighty quick.

Q. 48. By Mr. Westall: What part did Mr. Berry take in designing and installing the device?

Mr. Blakeslee: Objected to as leading.

A. He was the chief designer of the Girard Water Wheel Company.

Q. 49. By Mr. Westall: As chief designer what were his duties?

A. He made the drawings from which the wheels, housings, governors, gates and governing mechanisms were constructed.

Q. 50. I will now ask you to explain the operation of the devices shown in the photograph and point out the parts which you have previously mentioned in your general description, marking or lettering the different parts of the apparatus there shown, for identification, and to aid in better understanding your description.

Mr. Blakeslee: The same objection as previously noted.

A. "A" on the figure is the electrical generator. "B" is the fly-wheel enclosing the governor. "C" is one of the water-wheel units. "D" is another of the water-wheel units. "E" is the hypdraulic cylinder operating the main inlet gate F in the penstock G. "H"

is the collar with the oil-cup shown above it, which slides longitudinally on the water-wheel shaft referred to in my testimony. "I" is the lever, one end of which is attached to the collar and which is fulcrumed to the pedestal supporting the water-wheel shaft, and the other end of which connects by means of a rod not shown to the mechanism, hidden on this photograph behind the water-wheel case "C." "J" is the by-pass valve interposed or connecting the penstock at a point between the main intake-gate and the water-wheel gate to the tail-race. "K" is the arm on the stem of the by-pass valve which, in turn, is connected to the connecting rod running to the hydraulic cylinder. "L" is an exciter used solely for the purpose of exciting the fields of the electric generator. Those are the essentials shown in the picture.

Mr. Westall: Counsel for the defendant offers in evidence the photograph just referred to and asks that it be received in evidence and marked "Defendant's Exhibit Interior of Power Development Company's power house."

Mr. Blakeslee: Objection is made to the photograph offered as an exhibit on the ground that it is not within the pleadings in this case and that it is irrelevant, immaterial and incompetent, not identified and not properly proven.

(The said photograph so offered in evidence is marked "Defendant's Exhibit Interior of Power Development Company Power House", together with the title of the court and cause and the date of the offering of said Exhibit.)

Q. 51. By Mr. Westall: Can you produce any other

photographs showing a different view of the device which you have just described?

A. I can.

Q. 52. Will you please produce them.

A. I have here three reproductions of photographs or cuts of the device under discussion. One of them shows a perspective view of the fly-wheel governor mentioned in the description. Another of them shows a view taken between the two water-wheel elements of a single unit, and shows the details of construction very completely of the water-wheel-gate-operating mechanism. The other is an outline view showing the elements of construction of the governor wheels.

Q. 53. From your recollection of the construction of the device as to which you have been testifying, do you recognize the photographs and diagram just referred to as correctly illustrating and disclosing the devices of the water-wheel governor and its appurtenances, in use by the Power Development Company in 1896 and 1897 as previously testified to by you?

Mr. Blakeslee: Objected to as leading, calling for a conclusion, not the proper method of identification and proof, no foundation laid for the description and production of these pictorial representations, and upon the further ground that these representations are not responsive to the question, being apparently not—at least in one instance—a photograph of any device or mechanism actually constructed, and as the subject of the photograph. Further, that it is irrelevant, immaterial and incompetent.

A. I do.

Q. 54. By Mr. Westall: Please point out and indicate by letter or otherwise the various parts which you have heretofore described from the photographs just produced.

Mr. Blakeslee: The same objection.

A. Referring to the photograph marked XX, I have marked the water-wheel cases with the letter C; the stems of the water-wheel gates with the letter T; the penstock with the letter G; the by-pass valve with the letter J; the crank-arm on the stem of the by-pass valve with the letter K; the connecting rod connecting the by-pass valve with its operating mechanism, with the letter U; P represents the hydraulic cylinder which is connected through the cross-head Q to the rocker-arm R and to the connecting rod U, so that any motion of the piston in the hydraulic cylinder P, is transmitted to and gives motion to the rocker-arm R, and the stem of the by-pass valve at K. S is a sleeve in encircling this water-wheel shaft and is attached rigidly to the arm R and at either end attached by proper linkage connections and bell-cranks to the ends of the stems of the water-wheel gates as at T T. M is a bell-crank, one end of which is shown to be attached to the floating lever N. The opposite end of the floating lever is attached to the piston rod between the hydraulic cylinder P and the cross-head Q. O is the valve stem operating the valve for determining the position of the piston in the hydraulic cylinder P and is itself operated by its connection as shown by the floating lever N.

On the photograph marked ZZ, B represents the wheel enclosing the governor; H represents the collar which

has longitudinal motion along the water-wheel shaft and carries with it a collar attached to the forked end of the rocker lever marked I.

Photograph marked M Z is a photograph of an outline or diagrammatic drawing of the main elements contained within the governor wheel B.

Mr. Westall: Counsel for the defendant offers in evidence the photograph marked XX by the witness and asks that it be received in evidence and marked "Defendant's Exhibit XX".

Mr. Westall: Counsel for the defendant offers in evidence the photograph marked by the witness ZZ and asks that the same be received in evidence and marked "Defendant's Exhibit ZZ."

Mr. Westall: Counsel for defendant offers in evidence the diagrammatic drawing marked by the witness as M Z and ask that it be received in evidence and marked "Defendant's Exhibit MZ."

Mr. Blakeslee: Each and single of these showings is objected to on the offer in evidence of the same upon the grounds stated as to the non-inclusion of the same in the pleadings in this case, and as irrelevant, immaterial and incompetent, and upon the further grounds of insufficient and improper method of proof and identification, and as irrelevant, immaterial and incompetent.

(The said three exhibits so offered in evidence are marked respectively "Defendant's Exhibit XX", "Defendant's Exhibit ZZ", and "Defendant's Exhibit MZ", each together with the title of the court and cause and the date upon which it was offered in evidence.

Q. 55. By Mr. Westall: Is the Power Development Company now in existence?

A. So far as I know. Oh, yes; it is now operating.

Q. 56. Is the same corporation operating the same plants at Bakersfield?

A. I believe not. They are not operating the wheel shown in this photograph.

Q. 57. I will now ask you to compare the device shown and disclosed in Complainant's Exhibit HH, the Lyndon patent in suit, with the photographs which have been heretofore introduced, showing the water-wheel governor in use by the Power Development Company at Bakersfield.

Mr. Blakeslee: The same objection.

A. Referring to Figure 1 of the Lyndon patent, 2 represents the water-wheel case represented by the letter C in the photographs. And 1 in the Lyndon drawing it represents the penstock as shown by the letter G in the photographs. 47 in the Lyndon patent drawing shows the by-pass conduit containing the by-pass valve 48, which is shown by the letter J in the photographs. The remaining mechanism shown in the Lyndon patent is shown in the governor construction in the wheel B in the photographs in connection with the collars H, rocker-arm I, rod V, connecting same to the bell-crank M, floating lever N, valve stem O, hydraulic cylinder P, cross-head Q, rocker-arm R, crank-arm on by-pass valve stem K, connecting rod U of rocker-arm R, sleeve S with its connection to the stems T T of the water-gates of the wheels. Below the base which supports the water wheel cases C and the by-pass valve J is the tail-race or waste-

waterway for carrying away the water used in the wheel or that discharged by the by-pass valve, and is not shown in either of the above-mentioned photographs, being below the surface of the floor.

Mr. Blakeslee: Objection is made to the answer previously given and to the photographs taken in connection, that the showing on the photographs is only fragmentary and the comparison with the Lyndon patent in suit is made in connection with such fragmentary showing.

Q. 58. By Mr. Westall: I will ask you to state what, if anything, in your opinion is said or claimed to have been accomplished by Lyndon in the Lyndon patent in suit which has not been accomplished in the governing device which you have identified and described as being in use by the Power Development Company at Bakersfield in 1896 and 1897.

Mr. Blakeslee: Objected to on the same general grounds, and upon the further grounds that it calls for a conclusion. And, further, that the question apparently involves the interpretation of the Lyndon patent in suit in respect to the claims thereof as to which interpretation the witness has not qualified.

A. The Lyndon patent does not set out any results in the regulation of water-wheels that are to be desired which are not accomplished by the mechanism shown in the photographs and which were in use in the plant of the Power Development Company, and from my knowledge and experience with such devices it is my opinion that the mechanism constructed to conform to all the details of construction required for its operation as shown by

the Lyndon patent, would be practically inoperative, though theoretically correct,—as there are so many electrical contact points, so many friction clutches and so many small and intricate devices involved as to render the upkeep of such a device in practical operation prohibitive of its use.

Mr. Blakeslee: We ask that all that portion of the answer commencing with the words “and from my knowledge and experience” be stricken from the record and withheld from consideration as not responsive to the question and as a mere expression of an opinion and an arbitrary and sweeping conclusion on behalf of the witness.

Q. 59. By Mr. Westall: From your experience with water-wheel governors generally, as a practical hydraulic engineer, state whether or not a device constructed in accordance with the disclosures of the Lyndon patent would be a practical operative device such as could be used practically for the purposes for which it is evidently designed.

Mr. Blakeslee: Objected to as calling for a mere conclusion and not for any facts tending to prove the nature of operation of the device of the Lyndon patent in suit.

Q. 60. By Mr. Westall: I might add, in doing so, please explain fully your reasons for the opinions you may express.

A. The Lyndon patent does not show any superior regulating properties for water-wheels that have not been demonstrated by the mechanism used by the Power Development Company at Bakersfield prior to August,

1897. Nor does it show a device so simple in construction nor so easy of operation nor so easy to maintain in proper operating condition. With that view of construction set forth in the Lyndon patent, I would not advise anyone to construct the device there shown in anticipation of getting thereby a reliable and practical ~~Lyndon patent~~ ^{operating water-wheel governing} is a practical and operative device.

Mr. Blakeslee: We ask that the first portion of this answer be stricken out as not responsive, namely, all that portion which does not treat of the opinion of the witness as to the operativeness and practicability of the Lyndon device, and as to this we object to it as a mere expression of opinion and arbitrary conclusion of the witness.

Mr. Westall: The attention of counsel is called to the fact that the question specifically calls for a statement of opinion as well as the conclusions of the witness as to whether or not the device shown and described in the Lyndon patent is a practical and operative device.

Q. 61. By Mr. Westall: Please state briefly your reasons for considering the device illustrated in the Lyndon patent drawings as not practical.

A. My reasons for considering this device impractical in operation and hard to maintain in accurate service, are that it contains within its make-up too many friction clutches, which we all know ~~are~~ doubtful in action, too many electric pressure contacts, liable to easy derangement, and while it shows in its construction a theoretical solution of the problem, the practical carrying out of proper operation could not be accomplished with any reliable continuity of service.

Q. 62. From the date of the Lyndon application, September 13, 1900, to date, have you ever known of a single water wheel governing device constructed in accordance with the Lyndon specifications and drawings?

Mr. Blakeslee: Objected to as indefinite and calling for a conclusion on the part of the witness.

A. I have not.

April 2, 1914, A. M.

Mr. Blakeslee: Before proceeding further in this case, I wish to make a further statement with respect to the Defendant's Exhibits French Patent and Swiss Patent, prefacing such statement by a query to counsel for Defendant, namely, whether he contends or will contend that the said Exhibits mentioned are original letters patent issued in the respective countries and by the proper authorities of the respective countries, France and Switzerland.

Mr. Westall: The documents referred to introduced in evidence speak for themselves, and counsel for defendant does not at this time care to state what his contention regarding such documents is.

Mr. Blakeslee: Very well. Then, prior to taking further testimony as to these Exhibits as to which we are proceeding upon the assumption which we believe is supported by the papers, being the offered Exhibits themselves, and the inscriptions thereon, that the said Exhibits are copies; nevertheless, we will enter a further objection to their offer heretofore as Exhibits and their consideration as evidence in this case in any respect whatsoever, based upon the alternate assumption that

these Exhibits are original letters patent, namely, that there has been no proper foundation laid for the introduction of the same, that the same are not identified in any manner whatsoever, being manifestly, if of any value, nothing but alleged papers alleged to have been produced or written up or prepared in countries foreign to the United States and as to which cognizance cannot be taken by any court or department or branch of the Government of the United States, and that for these and other reasons such offered Exhibits are irrelevant, immaterial and incompetent, and not a class of evidence or any evidence which may be properly considered in this case. These further objections are registered without concession by the Complainant that these mentioned Exhibits are or may be original letters patent; but these further objections, or alternative objections, are registered because of the meager showing made by the Defendant in offering these Exhibits, and in view of the refusal by counsel for the Defendant to specify what it will be contended is the nature of these Exhibits with respect to their originality or mere purported duplication of originals.

Mr. Westall: Before proceeding further with the examination, and with a view possibly of shortening the subsequent examinations of both Defendant's witnesses and those of Complainant on rebuttal, I should like to ask counsel if, in view of the cross-examination of Complainant's witnesses on the *prima facie* ^{case} ~~face~~, he desires to limit his charge of infringement to any particular claim or claims of the patent sued upon, or whether he still insists that each and every one of the claims are

infringed by the devices in use or alleged to be in use at the Division Creek and Cottonwood plants as testified to.

Mr. Blakeslee: Complainant refuses to limit the charge of infringement to any claim or claims or portions of the Lyndon patent in suit. In the first place, there is no necessity for doing this, from our viewpoint, and, in the second place, the suggestion of such limitation does not come at the proper time and is tardy in its presentation. Counsel must know that the proper method to produce such an election of claim or claims or portions of patent sued under which are to be relied on is to request such election at the commencement of taking the Complainant's proof or by a motion to specify. Furthermore, it must be manifest to counsel for Defendant that after his exhaustive cross-examination of several of the witnesses for Complainant, in which he laboriously and, we contend, with quite some success, educated testimony comparing most of the claims term for term ~~which~~ ^{with} structures with which the charge of infringement is concerned, going into the matter of equivalence, Complainant cannot be expected to consider any such election at this time. At the present moment we stand upon the entire patent in suit.

Mr. Westall: Counsel for the Defendant does not know the law as so confidently asserted by counsel for the Complainant, and denies that anybody else knows the law in that way. It is pointed out that there was absolutely no objection on the part of the Complainant to a long drawn-out cross-examination involving every claim of the patent in suit. It is also pointed out that

the complaint charges infringement of all the claims of the patent in suit, and that those were the issues as originally presented and upon which this case has so far been tried.

Mr. Blakeslee: We do not propose to attempt to teach counsel the law; but, among other decisions, in order that there may be something concrete in the discussion, we refer counsel to the ruling of the Judge of this same Court in the suit of *Lawson vs. Remington*, in which counsel for Complainant was also counsel for Complainant *Lawson*, and in which under the old rules a demurrer was interposed to the bill, one of the grounds of which was the failure to specify what portions of the *Lawson* patent were elected to be relied upon in the suit, and the Court, approximately two years ago, sustained the demurrer upon that one ground and ordered Complainant to amend and specify the claims relied upon, which was done.

Mr. Westall: Counsel is perfectly familiar with the law on the subject.

EDWARD S. COBB, recalled.

DIRECT EXAMINATION (resumed)

By Mr. Westall:

Q. 63. In your previous testimony you have given long descriptions of the device and mechanism in use in the Bakersfield installation, namely, that used by the Power Development Company in 1896 and 1897. Without referring to any particular drawings or documents,

I will now ask you to state whether or not those descriptions were based upon previous examination of drawings or documents or whether they were made from your memory of the device in use at that time??

A. The description that I gave yesterday offhand without reference to any photograph or drawing or letters or figures was a description of the machine and mechanism as I see it in my mind at this time, and as I am certain it was constructed at that time.

Q. 64. Please explain how it is that you happen to be able to give such a complete and thorough description of the device after this lapse of time?

A. There are a number of reasons. In the first place the subject matter was along a line that I was working very diligently on at that time. Another reason is that I do not pay attention to many branches of business, all my business being directed toward mechanical and hydraulic matters. Another reason is that the particular device under consideration at the time of its submission for acceptance by the Power Development Company embodied new and exceedingly interesting mechanism for properly governing the speed and power output of water-wheels. Under the conditions that this system of water-wheels and governing mechanism was submitted to the Power Development Company for acceptance, it was to fulfill certain guaranties with regard to the regulation of speed and its efficiency as regards quantity of water used in proportion to the power output. The guaranty of efficiency was higher than usually suggested by builders at that time, and the guarantee of speed regulation was closer than was customary at that time. Consequent-

ly, when the plant was finally installed and submitted by the contractors for test, the greatest care was taken to see that tests were accurately and thoroughly made. The various tests were made and it was discovered that the efficiency of the water-wheel fell far below the guarantee. It was contended on the part of the parties constructing the wheels that the fault lay in the efficiency of the measuring instrument of the electrical end of the installation, and tests were made to determine, independently of the electric output, what the power output of the water-wheels were under certain conditions and under the conditions that were prevailing at the time of the test, and the water-wheels were still found to be low in efficiency and not fulfilling the conditions of the original guaranty. The tests showed that the water-wheels exceeded, however, all the conditions of the guaranty with reference to regulation of speed, and in that respect, and in respect to the ease of operation and certainty of operation were entirely acceptable to the Power Development Company. But, by reason of their falling below the efficiency guaranty, and by reason of the fact that other makers of wheels were anxious to make installations, under the belief that they could exceed the efficiency shown by these Girard wheels under test, the Power Development Company at a later date than any heretofore mentioned conducted to discard the Girard wheels and allow other makers of wheels opportunities to install their special devices with a view of obtaining a greater efficiency in the amount of water used, they fully knowing at the time, however, and admitting that the question of the quantity of the water used was not material to the suc-

cess of the plant as a whole because the conditions of their water right for power purposes was such that all the water that was taken out of the river at the upper end of the intake had to be delivered into the river before or at the lower point of the tail race, whether it passed through their water-wheels or not. The conditions of water rights below the power house on the river were such that this condition had to prevail. However, the Power Development Company did at a date later than August, 1897, try other makes of wheels, that, so far as my knowledge goes, were inserted on the same water-wheel shaft and within the cases of the water-wheels that are shown in the photographs heretofore submitted. I was not present at the installation or test of any of the wheels induced after the date of my report heretofore mentioned, which report was dated August 7 and 8, 1897.

Q. 65. By Mr. Blakeslee: You don't mean the first report?

A. No.

Q. 66. Not the report in evidence?

A. No; not the report in evidence.

Q. 67. By Mr. Westall: Can you produce the report that you have just referred to?

A. I can.

Q. 68. Will you produce it?

A. I have here a report written by myself as senior member of the firm of Cobb & Hesselmeyer, entitled, "Report Efficiency Test of the Girard Water Wheel at the Power House of the Power Development Company. San Francisco, California, August 24, 1897."

Q. 69. Please look at the signature at the end of the report and state whose signature that is.

A. I wrote the signature there "Cobb & Hesselmeyer, Engineers".

Q. 70. Was that report made to the Power Development Company?

Mr. Blakeslee: Objected to as leading.

A. This is the office copy that I retained of the report made to the Power Development Company.

Q. 71. By Mr. Westall: I notice that in producing this report you have sealed certain pages marking them "Sheets enclosed herein have no bearing on the case of Henry vs. the City of Los Angeles", dating them March 27, 1914. What was your reason for sealing that part of the report?

A. I closed those pages off of my own volition, because I knew that they dealt with the efficiency of the water-wheels involved in this case and presumed that the question of efficiency of the wheels was not pertinent to the present discussion, and I considered that the matter therein was matter solely the property of the Power Development Company and myself.

Mr. Blakeslee: We wish to object here to counsel and witness conferring during the progress of this deposition. If counsel wishes an adjournment, he can have it.

Q. 72. By Mr. Westall: When you speak of efficiency of the water-wheel, do you mean the efficiency of the particular governing device that you have described and shown in the photographs?

Mr. Blakeslee: Objected to as leading and attempting to coach the witness.

A. Not at all with reference to the governing device. The efficiency of water-wheels, as understood in its technical sense, refers to the percentage of useful power given out by the wheels in proportion to the theoretical power of the water supplied to them, and it was the low percentage of efficiency shown by these wheels that caused their final removal by the Power Development Company.

Q. 73. By Mr. Westall: Did the result of the efficiency test in any way change your idea with reference to the efficiency of the governing device which you have described?

Mr. Blakeslee: Objected to as leading.

A. We never considered the word "efficiency" exactly in connection with governors. But the operation of this governor as installed by the Girard Water Wheel Company in the power plant of the Power Development Company was far superior to anything that we had found prior to that time. Its regulation of speed was superior to the anticipation of the builders, and the regulation of the speed of the wheels under varying and suddenly applied loads was satisfactory to the Power Development Company. And it is my belief that although they induced different wheels and different nozzles into this plant after the wheels and nozzles of the Girard Company had been removed, they still retained the governing mechanism that had been installed by the Girard Company to control the nozzles of the succeeding wheels. I have no personal knowledge from my own observation that that is a fact, but it was the scheme contemplated the last time I was there.

Mr. Blakeslee: In view of the admission of the witness that the alleged continued use of the Girard device in this alleged 1897 Power Company installation was continued after the removal of the wheels originally installed in this plant, we ask that all that last portion of the last preceding answer relating to such governing device be stricken from the record and withheld from consideration as mere hearsay.

Mr. Westall: In the first place, there is no such admission as has been stated by counsel. The witness stated his belief that a certain condition of affairs continued.

Mr. Blakeslee: We will let the good English of the witness speak for itself as to this.

Mr. Westall: Counsel for Defendant offers in evidence the report produced and testified to by the witness, namely, the report marked "Report Efficiency Test of the Girard Water Wheels at the Power House of the Power Development Company. San Francisco, California, August 24, 1897", and ask that those parts of the report which have been left unsealed be received in evidence and marked "Defendant's Exhibit Cobb Efficiency Report."

Mr. Blakeslee: We object to the offer and acceptance of this paper in evidence under the general grounds of objection heretofore registered, and on the further ground that the paper is not properly proven and is irrelevant, incompetent and immaterial, and that it is not offered in toto, but only in fragmentary form with the reservation under seal of certain parts which may be far more germane to the issue than any other part thereof, if at all. The further objection is made that this report

is not a publication prior to the date of the Lyndon invention and that it is not a publication at all.

Mr. Westall: In view of the objection of counsel the witness has consented to unseal the sealed portion, and the report as a whole is offered in its entirety.

(The said report so offered in evidence is marked "Defendant's Exhibit Cobb Efficiency Report", together with the title of the court and cause and the date when same was offered in evidence.)

A. I wish to say in reference to this that when I took this report from my files for the purpose of allowing its use by counsel, I had in mind that all that they wanted from this report was the description contained therein in reference to the general construction of the power plants; and knowing that most of the report was in reference to the efficiency of water-wheels, I ran the thing over very carelessly and quickly and found that the first two pages covered all the points that I thought the attorney wanted, and, consequently, I grabbed up all the other pages that did not contain my signature and sealed them up without reading them at this time, and, as a matter of fact, I have not myself read them since 1897. Now, in view of that being the reason for sealing them up, I will now unseal them so that if counsel for Complainant or Defendant care to examine them they can do so.

Q. 74. By Mr. Westall: Taking up Complainant's Exhibit HH, the Lyndon patent in suit, I will ask you to compare the Bakersfield construction about which you have been testifying at the Power Development Company in 1896 and 1897, with the device described in Claim

6 of the patent in suit, stating fully your reasons for any opinions you may express.

Mr. Blakeslee: We object to this question, in so far as the claim is ^{disputed} ~~concerned~~, as a part of the grant evidenced by the issuance of the patent in suit, as being put to a witness who has not qualified to make any such comparison, and, in that respect, is irrelevant, immaterial and incompetent.

Q. 75. By Mr. Westall: I will ask you in answering this question to point out in the photograph which you have produced the parts referred to in the claim and which you consider to be equivalents of those mentioned in the claim.

A. Claim 6 reads as follows: "In a water-wheel governor, the combination with means for operating the water-gate in either direction, a by-pass for the water-wheel, and a valve controlling said by-pass, of means connected to the water-gate operating means and operating the by-pass valve inversely to the operation of the water-gate." Referring to the photograph in evidence marked XX, "Means for operating the water-gate in either direction" are shown by the hydraulic cylinder P, its cross-head Q, the rocker arm R, the cylindrical connection S with the linkages shown in the photograph, connecting the same to the stems of the water-gates, which said stems are marked TT. "A by-pass for the water-wheel" is shown in the same photograph at J. "A valve controlling said by-pass" is within the case upon which the letter J is marked, and is operated by a stem centrally located therein, which passes through the rocker-arm attached thereto and marked K. "Of means con-

connected to the water-gate-operating means" is shown in the photograph referred to by the long connecting rod U connecting the above mentioned crank-arm K to an extension on the rocker-arm R, which, in turn, is connected to the cross-head Q of the hydraulic cylinder P. "Inversely to the operation of the water-gate" does not of itself appear on the photograph, but the operation was such that as the by-pass was opened the water-gates were closed, and vice versa.

Q. 76. I will now ask you to make a similar comparison as called for in the last question, of the device described with that attempted to be covered by Claim 7 of the Lyndon patent in suit.

Mr. Blakeslee: The same objection.

A. Claim 7 reads as follows: "In a water-wheel governor, the combination with means for operating the water-gate in either direction from normal position, a by-pass for the water-wheel, and a valve for such by-pass, of means connected to the water-gate-operating means and adapted to operate the by-pass valve from normal position in either direction, so as to control such valve inversely to the control of the water-gate, during the governing action of the water-gate, and means for returning the by-pass valve to normal position on completion of governing movement of the water-gate-operating means." "In a water-wheel governor, the combination with means for operating the water-gate in either direction from normal position," means for operating the water-gate in either direction from normal position is shown in the photograph XX, before referred to, by the hydraulic cylinder P, its piston rod and cross-head

Q and rocker-arm R, and cylindrical connection S, and the arms there shown connecting said cylinder S to the water-gate stems TT. "A by-pass for the water-wheel" is shown at J. "And a valve for such by-pass" is the name to the moving part inclosed within the case marked J. "Of means connected to the water-gate-operating means and adapted to operate the by-pass valve from normal position in either direction," the means consisted in the long connecting rod U extending from the cross-head Q of the hydraulic cylinder P, and connecting its outer end with the arm K attached to the by-pass valve at J, the construction, though, not shown clearly in the photograph, but operates to open the water-gate and close the by-pass valve simultaneously or to open the by-pass valve and close the water-gates simultaneously, and in such manner as to maintain steady or regular flow of water in the penstock, and entirely controlled, first, by the position assumed by the piston in the hydraulic cylinder P, which position is determined by the position taken by the several elements making up the governor construction contained within the wheel B, shown on photograph Exhibit ZZ, thus giving governing action to the water-gate. "Means for returning the by-pass valve to normal position on completion of governing movement of the water gate operating means". That phraseology as just quoted from Claim 7 is not clear to me as to its meaning, but it appears to me to mean that if a water-gate is in a position to supply a proper quantity of water to a wheel to overcome a given load at a given speed, and by reason of a momentary change of such load the speed increases or decreases and

the governor acts to return it to its proper speed, this returning to that proper speed would bring the parts in to what the claim calls a normal position, which to me must mean the normal position assumed by all the parts at any specified load, but at a fixed speed. If it does not mean that, it does not mean anything, in view of the construction. It must appear clear upon studying these devices wherein parts are given motion to operate water-wheel gates, and that the same parts are also used to regulate speed, two things must be true: First, that for any given load, and, consequently, any given position of water-wheel-gate opening and the governing mechanism must occupy a certain position; and, while occupying that position, which, bear in mind, will be different for every different load, it must be in a condition to move quickly in either direction due to any change of speed, without reference to the quantity of water passing through the water-wheel gates. Now then, I assume that the normal position referred to is that position of the governing mechanism and of the water-wheel gates which corresponds to a given load or any given load at a given speed, and under those conditions the gates will be in the same identical position that they will always be for that load and that speed, and the bypass will be in a position that it will always be for that load and that speed. Then, the whole system being in balance, any change of speed will be available to change the position of the governing parts and change the position of the water-wheel gates to bring the speed again to normal condition, and in doing this would bring the parts that have been moved back to normal position spe-

cified in the claim. The mechanism in the installation of the Power Development Company which accomplishes this result is, first, all the parts contained within the wheel B, together with the longitudinal sliding collar H, the forked rocking lever I, the connecting link V, the connecting rocking lever I through the bases of the water-wheels to the bell-crank M, the floating lever N, the valve stem and valve O, the hydraulic cylinder P, the rocker-arm R, the connecting rod U, the arm of by-pass valve K, the by-pass J, the cylindrical sleeve S and the link-ages connecting same to the stems T of the water-wheel gates. These parts will operate in such a way or in such a manner that if for any given load on the water-wheel the piston within the hydraulic cylinder P and, consequently, its cross-head Q, assume a definite position; and while they are occupying that position the levers or bars heretofore referred to as being inclosed in the governor wheel B, and which are shown diametrically on the photograph Exhibit MZ, assume a like definite position corresponding to the load, and when this position has been assumed, speed being normal and correct, the levers float in the air, so to speak, and having extremities free of contact with any part of the wheel B. They may be said, in this position, to be floating in balance, ready to move in either of the two directions which it is possible for them to move in. Any change of speed to either increase or decrease the number of revolutions, will immediately change the position of these levers, due to the change of centrifugal force which is at that time acting within them. That will cause a change in the position of all the parts connecting said levers to the hydraulic

cylinder and cause the piston therein to assume a new position to correct the change in speed and bring them back to normal conditions of operation. This, I believe, makes it clear that the mechanism shown operated as a speed governor at any position which it was compelled to assume by reason of being a governor controlled by the load passing from the water-wheel shaft to the electric generator in this particular case. It was in use a most satisfactory and reliable governing mechanism. That, I believe, covers the question concerning Claim 7.

Q. 77. By Mr. Westall: I now call your attention to a certified copy of letters patent No. 668801, granted February 26, 1901, to Newton Lamb for improvement in regulating devices for impact water-wheels, and ask you to state whether you have examined that patent and whether you understand the devices therein shown and described.

Mr. Blakeslee: This question is objected to on the ground that it is irrelevant, incompetent and immaterial, not being pleaded in the answer in this case properly as a publication prior to the date of the invention of the Lyndon patent in suit nor prior to the date of the application, namely, September 13, 1900, for the Lyndon patent in suit. The said Lamb patent is only set up in the answer in this case as a printed publication "Prior to the alleged or any invention or discovery thereof by the said Lyndon patent". Manifestly, the publication of the Lamb patent was not prior to the date of the application for the Lyndon patent in suit, as established in that connection. And we likewise contend that it was in no sense prior, and it must follow that it was in no sense prior

to the date of the invention of the Lyndon patent in suit. We therefore object to the consideration of this Lamb patent or the purported Lamb invention, in any respect whatsoever, as not within the pleadings in this case, and, therefore, irrelevant, immaterial and incompetent.

A. I have looked over the drawings and read over the description contained in this patent and understand the operation of the devices therein shown.

Q. 78. By Mr. Westall: Will you please describe in as untechnical language as possible the device therein shown and described and the principle of its operation, the results accomplished, and the manner in which those results are accomplished, stating fully any reasons for any opinions you may express.

Mr. Blakeslee: The same objections, and the objections last registered will be understood as repeated without the necessity of actual repetition to any questions put about this purported Lamb patent or any purported disclosure thereof.

Mr. Westall: Counsel for Defendant offers in evidence a certified copy of the patent referred to, namely, Patent No. 668801, granted February 26, 1901, to Newton Lamb, as before described, and ask that it be received in evidence and marked "Defendant's Exhibit Lamb Patent."

Mr. Blakeslee: We object to the offer and admission of this purported certified copy of the Lamb patent, for the reasons heretofore stated, namely, that any such purported patent does not come within the pleadings in this case, not being set up in the answer excepting erroneously as a publication prior to the Lyndon invention;

and it is therefore, irrelevant, incompetent and immaterial with respect to any of the issues in this case, and incapable of consideration for those reasons.

(The said certified copy so offered in evidence is marked "Defendant's Exhibit Lamb Patent", together with the title of the court and cause and the date upon which said Exhibit was offered in evidence.

April 2, 1914, P. M.

By Mr. Westall:

*J. L. Berry recalled
direct examination
resumed*

(The question asked the witness before adjournment, to-wit, Q. 78, is read by the Examiner.)

A. The device shown in the Lamb patent sets out a rotating element for a water wheel indicated by 2 in Figure 1 of the drawing, which may be supplied with water under pressure for causing the rotation through the water passage 6, 6 and 7, the general supply of water being provided by the circular penstock 4. Two nozzles or passages for the admission of water to this wheel are provided of special construction. One of these passages 7 direct the water upon the wheel in the same direction that the other passages 6, 6 and 6 direct it, and in a direction to cause revolution of the wheel in a proper manner to perform useful work. The nozzle 7 is provided with a gate 9 which determines the quantity of water passing to the nozzle 7 from penstock 4. There is also provided an additional nozzle 8 which discharges water against the wheel from the penstock 4 in an opposite direction to that supplied by the nozzle 7 from penstock 4, and this nozzle 8 is also provided with a regulating gate 9 which may determine the quantity of water

discharged through nozzle 8 against the rotation of wheel 2. As set forth in the patent, the object of providing these two special nozzles, one a driving nozzle and the other a retarding nozzle, was so that whatever amount of water was shut off from the driving nozzle would be discharged by the reverse or compensating nozzle 8 for the purpose of varying the speed of the wheel and the power given off by the wheel. The action of these two nozzles is such, as set forth in this patent, as to provide a means of preventing the fluctuation of pressure in the penstock due to changes of quantity of water required by the operating nozzles when the speed of the wheel is changed by increase or decrease in the number of revolutions. Assuming that a wheel constructed as set forth in the patent was operating under a given load, and assuming that the nozzles 6, 6 were all open and supplying water to the wheel, that the nozzle 7 was one-half open, supplying water to the wheel in the same direction and for the same purpose as the water passing through nozzles 6, and the nozzle 8 was also half open and discharging water against the wheel in an opposite direction from nozzle 7, and such water from nozzle 8 acting to retard the wheel in its proper direction of revolution, the arrangement set forth in the patent under discussion is such then that any change in speed of revolution caused by any outside forces will change the relative positions of the gates of nozzles 7 and 8 in such a way that if the speed of the wheel starts to increase, the supply of water to nozzle 7 will be decreased and the supply of water to nozzle 8 will be increased; and vice versa, if the external force acted to decrease the speed of the

wheel the governing mechanism operates in such manner as to increase the supply of water supplied by nozzle 7 and decrease the supply of water discharged by nozzle 8, giving in this respect a governing construction easy of operation, and operating without changing the velocity of flow of the main water supply in the penstock. The construction in this respect performs the same function as is performed by supplying a by-pass made more distinctly separate from the nozzle O, indicated in the patent in suit, because, as you will understand from the above description, any water cut off from the nozzle 7 by its gate 9 is supplied to the nozzle 8 by its gate 9 as above described. Consequently, although the quantity of water driving the wheel in the desired direction has been changed, the quantity of water flowing through the penstock has not, thus showing means of accomplishing the results desired to be obtained by the construction shown in the patent in suit.

Q. 79. By Mr. Westall: I will ask you now to compare the device shown and disclosed in the Lamb patent No. 668891, just referred to, with the device shown and described in the Lyndon patent in suit.

Mr. Blakeslee: The same objection.

A. Referring to Figure 1 in the Lyndon patent in suit and also Figure 1 in the Lamb patent No. 668801, in the Lyndon patent the penstock is represented by 1; in the Lamb patent by 4. The wheel-case is represented in the Lyndon patent by 2; in the Lamb patent partially by 4 but showing no side-sections, the water in this wheel construction being discharged centrally and the design showing no special construction to prevent its dropping

immediately away from the wheel. The water-wheel-driving shaft is 3 in the Lyndon patent and also 3 in the Lamb patent. The by-pass in the Lyndon patent is represented at 47 and the gate in the by-pass is represented at 48. In the Lyndon patent this gate 48 closes as the main operating gate, whose stem is shown at 21b, is operated. In the Lamb patent the gate 9 for nozzle 8 operates in conjunction with the gate 9 of nozzle 7 in the same manner. That is to say, that when the gates operated by 21b are open and the by-pass valve 48 is closed in the Lyndon patent, then in the Lamb patent as the gate 9 behind nozzle 7 is opened the gate 9 behind nozzle 8 is closed, the object of the motion given to these valves in both cases being to prevent a change in the velocity of flow of the water in the penstock due to a change in supply of water to the water wheels, for the purpose of speed regulation. I think that covers the ground.

Q. 80. By Mr. Westall: Referring to Claim 6 of the Lyndon patent in suit, I will ask you to compare the device described in said Claim 6 with Defendant's Exhibit Lamb Patent and the device therein disclosed, and point out any similarities or differences you may find in operation, result or effect, giving in full your reasons for any opinions you may express.

Mr. Blakeslee: The same objection, and the objection previously made is repeated, namely, that the witness has not qualified to discuss the subjects of any claim of the Lyndon patent in suit, as a part of the patent, considered as to its legal effect.

Mr. Westall: The question does not go to the legal

effect of the patent; and, as to the qualifications of the witness to answer the question, the record very abundantly speaks for itself.

Mr. Blakeslee: We make the further objection that, so far as the record so far has developed, it does not appear that the witness is conversant with the disclosures of the letters patent nor with the interpretation thereof.

Mr. Westall: I do not understand that the function of an expert is to interpret claims of a patent. That is a function for the court. The question does not ask the witness to perform any function left by the law to the court.

Mr. Blakeslee: Well, the witness has been asked to compare the subject of Claim 6 with something else. We will have to put the other objection that the question is necessarily based upon an interpretation of such claim in order that the witness may erect, for the purposes of his answer, a definite subject which can only be erected upon some sort of an interpretation of that claim.

A. Claim 6 reads: "In a water-wheel governor, the combination with means for operating the water-gate in either direction, a by-pass for the water-wheel, and a valve controlling such by-pass, of means connected to the water-gate-operating means and operating the by-pass valve inversely to the operation of the water-gate."

In the Lamb patent under discussion, referring to Figure 4, the rod 25, bar 24, link 23, and lever 20 operate the water gate 9 of nozzle 7 in Figure 1. In Figure 4 of the Lamb patent, rod 25, bar 24, link 23 and rocker-arm 20 operate valve 9 supplying water to nozzle 8 as shown in Figure 1, thus showing a direct means for operating

the water gate in either direction, a by-pass for the water wheel and a valve controlling said by-pass. The same mechanism above indicated operates in such manner that when valve 9 of nozzle 7 is opened for an increased flow of water, valve 9 of nozzle 8 is correspondingly closed, and vice versa.

Q. 81. By Mr. Westall: I will now ask you to compare the device described in Claim 7 of the Lyndon patent in suit with that disclosed in Defendant's Exhibit Lamb Patent, stating in full your reasons for any conclusions you may express or any opinions that you may give.

Mr. Blakeslee: The same objection as last noted.

A. Claim 7 of the Lyndon patent reads as follows: "In a water-wheel governor, the combination with means for operating the water-gate in either direction from normal position, a by-pass for the water-wheel, and a valve for such by-pass, of means connected to the water-gate-operating means and adapted to operate the by-pass valve from normal position in either direction". The devices shown in the Lamb patent for accomplishing these results are, referring to Figure 1, the valve 9 supplying water to nozzle 7, the valve 9 supplying water to nozzle 8, the stems 12 for these valves and the connecting levers 18; and in Figure 4 the levers 20, links 23, bar 24 and rod 25, which rod is attached to a governor described as being operated by pulley 30 from main water-wheel shaft 3. And the construction is such in the Lamb patent as to control such valve 9 in by-pass 8 inversely to the control of the water-gate 9 of nozzle 7 during the governing action of the water-gate. "And means for returning the by-pass valve to normal position on com-

pletion of governing movement of water-gate-operating means". These valves 9 in the Lamb patent are returned to their normal position only by a change of speed in the governing mechanism. This patent does not disclose any device for returning them by any consideration of the load carried on the wheel, and the operation of the two valves 9, which determine the water supply to the nozzles 7 and 8, is controlled by the speed element of the governor. When the governor increases in speed the water supply to nozzle 7 is decreased, and the water supply to nozzle 8 is increased; and when the speed of the governor is decreased the water supply to nozzle 7 is increased and the water supply to nozzle 8 is decreased.

Q. 82. By Mr. Westall: Referring now to line 28, page 1, of the Lyndon specifications, reading: "I provide a by-pass inserted into the penstock or flume at a point near the water-gate and a gate in the said by-pass controlled by the same governing mechanism that controls the water-gate and operating to allow a greater or less flow through the by-pass, according as the water-gate is being closed or opened." I will ask you to consider that language in connection with the Defendant's Exhibit Lamb patent in suit, and state in what respect, if at all, such language is inapplicable to the device described and disclosed in the last named patent.

Mr. Blakeslee: The same objection.

A. The language in question describes the by-pass inserted in the penstock at a point near the water-gate, and a gate in said by-pass controlled by the same governing mechanism that controls the water-gate, and operating to allow a greater or less flow through the by-pass

according as the water-gate is being closed or opened, as shown in the Lamb patent, and as descriptive of that construction. The object of the construction outlined in the above quotation was to produce such an operation of the valves in the by-pass and at the water-gate as to maintain a uniform flow of water in the penstock in both cases, when the governors were operating to maintain uniform speed and wheels operating otherwise under normal condition in both cases.

Q. 83. By Mr. Westall: I now call your attention to Defendant's Exhibit Translation of French Patent and ask you to state whether you understand the device therein described and illustrated in the drawing attached to Defendant's Exhibit French Patent which I now hand you, and whether you have heretofore examined said patent with a view of testifying in this case and with a view of explaining the operation and effect of the device therein shown.

Mr. Blakeslee: This question is objected to in that it involves the Exhibit French Patent objected to as not identified and the other objections of record with reference to this Exhibit; and the objection is made as to the Exhibit Translation of French Patent, that it is not a proven translation, and is irrelevant, immaterial, incompetent, as to any issues in the case.

A. I have examined the Exhibit and understand its operation.

Q. 84. By Mr. Westall: Will you please explain and describe the device therein described and disclosed, freeing the subject as far as possible from technical language,

and state fully your opinions and the reasons therefor, as to the operation and effect of said device.

Mr. Blakeslee: The same objection.

A. Referring to the drawing accompanying the Exhibit, we find at the left hand end of the lever u an outline diagram of a fly-ball speed governor of a design here shown such that an increase in its number of revolutions would tend to raise the left hand end of the lever u, and a decrease in the number of revolutions would tend to lower the left hand end of the lever u. The lever u is fulcrumed by means of the link shown by the solid line to the lever w, which, in turn, is fulcrumed on a fixed support. The right hand end of the lever u is connected to the operating stem of a slide valve. Lever w, above referred to, has its right hand end connected to the piston rod extending upward from a piston s, which can move backward and forward or up and down in cylinder r. Below piston s the piston rod is extended as v and connects to arm x for operating the water-wheel gate, and from the text we learn that any downward motion of the piston s and its stems v closes the water-gate. At the upper end of the piston rod v there is attached the left hand end of rocker lever j, which is fulcrumed at a fixed point z, and whose right hand end is connected to piston stem p in regulator weight k. Below the regulating weight k is provided a tapered valve i which is made integral with weight k. Said valve i closes a passageway g formed in the center of piston e, which passageway extends clearly through the whole length of said piston, but is much larger in size at its lower end where it comes in contact with the "compressed water". a

represents a connection to the penstock and c is a by-pass discharge from said penstock. b which is connected to piston e and which contains also a continuation of the passageway g, is the valve which closes the by-pass c between said by-pass and penstock d. The operation now is as follows: Suppose that the water-wheel were running in normal condition as to load and speed, and that the parts were in ^{the} positions as indicated and that the speed is, by reason of an increase of load or some exterior force, suddenly decreased. This will cause the balls shown in the outline of the governor at the left hand end of the lever u to fly outward and raise the left hand end of the lever u, thus depressing the valve shown to control the supply of water to the hydraulic cylinder r for operating piston s. The valve t, thus being moved downward, will allow the water to enter above the piston s and force it downward, causing the rocker-arm x which operates the water-wheel gate, to swing its left hand end downward and close said water-wheel gate. As the downward motion of piston s takes place, it draws down the right hand end of the lever w and raises the fulcrumed center of the lever u and causes the valve to rise and cut off a further supply of water to the hydraulic cylinder r above the piston s, and thus stopping its motion. Coincident with the motion of the piston s downward, above referred to, due to the supply of pressure on the upper side thereof in the hydraulic cylinder r, the left hand end of the lever j so pulled downward, and the right hand end thereof moved upward about the fulcrum z, and lifting therewith the rod p, the piston l enclosed in the case k, and surrounded by oil or water

q, the first effect of which is to raise the valve-plug i from the opening g through the piston rod e, and the piston b forming the by-pass valve. When the valve i is raised, the pressure above the piston b and under the cover f of the cylinder d enclosing said piston b throughout the length of the passage g, was uniform; but when the valve i raises the pressure is immediately reduced in the passage g and also in the space above the piston b through the openings h in the piston rod e, all of which openings are made larger than the opening that directly connects the passage g with the "compressed water" in the penstock. The pressure above the piston b being removed, the pressure of the water in the penstock causes the piston b, which is the by-pass valve, to rise and make a direct opening for the escape of water from the penstock through the by-pass c. While the operation just described was taking place, the liquor surrounding the piston l, above mentioned, which is free to move regulator k, was being held in position, as before mentioned, by the rod p and the lever j; but the regulating case k with its superimposed weight was slowly dropping while the liquor above the piston l was slowly passing down through passage n to the under side of said piston l, which operation continued until regulating case k with its tapered valve i had dropped sufficiently to close opening g in by-pass valve b.

If the mechanism disclosed were in normal position and the water-wheel were in normal position and the speed were decreased, the balls shown in the outline of the governor in the left hand end of lever u would be drawn together and the left hand end of lever u would

drop, and, by means of its connection to valve t of hydraulic cylinder r, water under pressure would be admitted underneath piston s and act, through piston rod v and arm x, to open the water-gates to the water-wheel. At the same time that piston rod v was moving to operate the water-wheel gates, it would also throw the lever w and the lever u, operating the valve t, to close off the supply of water under pressure in hydraulic cylinder r under piston f and prevent further motion, and, at the same time, would raise the left hand end of rocking-lever j, which is fulcrumed at the fixed point z, and depress rod p, carrying a loosely supporting piston m in regulator cylinder k. When the piston p was forced downward by the lever j it opened a passage m through piston l in addition to the fixed passage m previously mentioned, and allowed the liquor surrounding piston l to flow with greater rapidity from the space below said piston to the space above it, and allowed the regulating cylinder k to maintain a pressure upon valve i to keep closed the passage g in piston e and valve b. Valve i, maintaining this closure, causes the pressure above the piston b to be greater than that below piston b, because of the larger area of the upper end thereof, and this increased pressure acts to drive piston b downward, closing the passageway between ~~by~~ by-pass c and penstock a. The above description shows that there is coincident action between the operation of water-gates and by-pass valve.

Q. 85. By Mr. Westal: Referring now to Complainant's Exhibit HH, the Lyndon patent in suit, I will ask you to compare the device therein shown and described

with the translation and drawing of the French patent No. 291588 to which you have referred in your last preceding answer, and point out the similarities or differences which you may find in the devices therein disclosed.

Mr. Blakeslee: The same objection as previously noted with respect to Defendant's Exhibit French Patent and Defendant's Exhibit Translation of French Patent.

A. By-pass c on drawing of French patent corresponds to by-pass 47 in the Lyndon patent. Piston or by-pass valve b in the French patent corresponds to the valve 48 in the Lyndon patent. Arm x operating water-gates of the French patent corresponds properly to stem 21b operating water-gates in the Lyndon patent. a in the French patent indicates the penstock which is represented by 1 in the Lyndon patent. All the other mechanism shown in Figure 1 of the Lyndon patent is introduced and designed to accomplish the same results as the mechanism shown in the French patent, and as well the remaining portions of the mechanism shown in the French patent not just mentioned, the object in both cases being to operate a by-pass valve simultaneously with the operation of the water-wheel gates and do it in such manner as to prevent over-run in either case. The French patent does not, of course, show any electrical devices, it being purely a mechanical and hydraulic mechanism aided by centrifugal force in the speed-measuring element.

Q. 86. By Mr. Westall: Referring now to Claim 6 of the Lyndon patent in suit, I will ask you to compare the device therein disclosed with that which you have described as forming the subject matter of the French

Patent No. 291588 about which you have been testifying.

Mr. Blakeslee: The same objection as previously noted with respect to Defendant's Exhibit French Patent and as to the qualifications of the witness to discuss the subject of Claim 6 of the Lyndon patent in suit.

A. All the elements set up in Claim 6 of the Lyndon patent are shown in the drawing and described in the French patent, as follows: "Means for operating the water-gate in either direction" as set up in Claim 6 is disclosed in the French patent by the hydraulic cylinder *r*, its piston *s* and connections to the water-wheel gate. "A by-pass for the water-wheel" is shown in the French patent at *c*. "And a valve controlling said by-pass" is shown in the French patent by *b*. "Of means connected to the water-gate-operating means and operating the by-pass valve inversely to the operation of the water-gate" is shown in the French patent mechanism connecting piston *s* of the hydraulic cylinder *r* with the remaining mechanism shown on the drawing and connecting through to by-pass valve *b*.

Q. 86. By Mr. Westall: Please now make a similar comparison with reference to Claim 7 of the Lyndon patent in suit.

Mr. Blakeslee: The same objection as last noted.

A. In Claim 7, "With means for operating the water-gate in either direction from normal position" is indicated in the French patent by the hydraulic cylinder *r*, piston *s*, piston stem *v*, and arm *x*, operating water-gate in either direction from normal position. "A by-pass for the water-wheel" is provided at *c* in the French patent. "A valve for such by-pass" is provided by the

piston b in the French patent. "Means connected to the water-gate-operating means and adapted to operate the by-pass valve from normal position in either direction" is shown in the French patent by the piston rod v, lever j, fulcrum z, regulating cylinder k with its enclosed mechanism and its valve i, with piston e and by-pass valve b enclosed in cylinder d, with cover f, as heretofore described, and their arrangement is such as to control such by-pass valve inversely to the control of the water-gate during the governing action of the water-gate. "Means for returning the by-pass valve to normal position on completion of the governing movement of the water-gate-operating means" are provided in the French patent by the positions which in actual operation are assumed relative to each other by the rod p, piston l, regulating cylinder k with its attached valve i, by-pass valve b with its rod or piston rod e, and passageway g with openings h, all enclosed in cylinder d with cover f. The above mentioned rod p is connected by oscillating lever to piston-rod v of piston s and hydraulic cylinder r.

Q. 87. By Mr. Westall: What function results or affects, if any, in water-wheel regulation made out, sought for or described in the Lyndon patent in suit, do you find not fully disclosed in the French patent to which you have just referred in your last preceding answer?

Mr. Blakeslee: Objected to as calling for a sweeping conclusion and not for such further comparison or contrasting of the Lyndon invention and the disclosure of Defendant's Exhibit French Patent as may be required of the witness.

A. None, and the object of both of these patents be-

ing to cover such a construction as will maintain a constant flow of water in a penstock when a varying quantity of water from the penstock is discharged to the water-wheel doing useful work.

Q. 88. By Mr. Westall: I now call your attention to Defendant's Exhibit Swiss Patent and Defendant's Exhibit Translation of Swiss Patent, and ask you if you have examined said documents and if you understand the devices therein described and shown.

A. I have examined the documents particularly with reference to the drawings, and I understand the operation as indicated.

Q. 89. Please now explain fully the drawing of Defendant's Exhibit Swiss Patent and explain the operation of the device therein shown in the light of the translation which has been placed before you, stating fully your opinions in regard to the operation and effect thereof, and your reasons therefor.

Mr. Blakeslee: The question is objected to on all the grounds of objection previously urged to Defendant's Exhibit Swiss Patent and Defendant's Exhibit Translation of Swiss Patent, and as being irrelevant, immaterial, incompetent, particularly that the said Swiss patent is not set up in the answer in this case and is not identified, or the apparent copy, being the Exhibit, is not identified. On the further particular ground that the translation is not a properly proved translation. The attention of counsel is again called to our objection as to Defendant's Exhibits Swiss Patent and Defendant's Exhibit French Patent namely, that there is no evidence before the court that these patent or copies of the pat-

piston b in the French patent. "Means connected to the water-gate-operating means and adapted to operate the by-pass valve from normal position in either direction" is shown in the French patent by the piston rod v, lever j, fulcrum z, regulating^{ing} cylinder k with its enclosed mechanism and its valve i, with piston e and by-pass valve b enclosed in cylinder d, with cover f, as heretofore described, and their arrangement is such as to control such by-pass valve inversely to the control of the water-gate during the governing action of the water-gate. "Means for returning the by-pass valve to normal position on completion of the governing movement of the water-gate-operating means" are provided in the French patent by the positions which in actual operation are assumed relative to each other by the rod p, piston l, regulating cylinder k with its attached valve i, by-pass valve b with its rod or piston rod e, and passageway g with openings h, all enclosed in cylinder d with cover f. The above mentioned rod p is connected by oscillating lever to piston-rod v of piston s and hydraulic cylinder r.

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A. None, and the object of both of these patents be-

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ents are predicated upon any issue of letters patent of France or Switzerland, or any publication caused by any such issue, no proof being before the court as to such issuance or publications, or as to any dates involved in any such issuances or publications.

A. Referring to the drawings attached to the patent in question and to Figure 1 thereof, a represents the penstock carrying the water supply. b represents the passage or gateway between the penstock and water-wheel. d represents the valve for closing the water-gate-way to the water-wheel. c represents passageway forming by-pass between penstock a and water-gate-passage way b. g represents a valve for controlling the flow through said by-pass c. In the upper part of the figure m represents a speed-governor which is connected by links, not lettered, to the top of rods passing to piston f which, in turn, contains piston k enclosing spring l and rod e, operating water-gate d. Piston k through connection p and links or bell-cranks h give motion to by-pass valve g. The mechanism above described, consisting of piston f, rod e directly connecting with water-gate valve d, and the interior piston k connecting by means of the connection p and bell-cranks h with valve g, form the operating mechanism for operating the water-gate valve d in conjunction with the by-pass gate g, the operation in general being as follows: Any change in the elements of the speed-regulator m, due to a change of speed, will raise or lower and open or close a valve at n supplying water under pressure to the chamber o above piston f. The valve at n also will allow of the discharge of water from chamber o, above piston f, through the opening

shown below *n* into the main wheel-case. Pressure supplied in the chamber *o* acts to force downward the piston *f* which, acting through the rod *e*, closes the water-gate valve *d*; and if water contained in the chamber *p* changes in existence between the interior of piston *f* and the annular piston *k*, the piston *k* will also be forced downward and through the connection *p* and the bell-cranks *h* will open the by-pass valve *g* in the by-pass *c*. When the condition of operation of the governing mechanism *m* is such as to move the valve at *n* to allow the water-pressure in *o* to be relieved, the pressure of the water in the penstock against the gate *d* will raise a rod *e* and the piston *f* to its original position, carrying with it the annular piston *k* with its connection *p*, connecting to the bell-cranks, and by means of the bell-cranks, to the by-pass gate *g*. The relative positions maintained between the water-gate *d* and the by-pass gate *g* is adjustable by the location of the annular piston *k* within its cylinder *p* which is formed on the interior of piston *f*. The supply of pressure to this chamber comes from the chamber *o* through a small passage *r* in the piston *f* which connects to the chamber *p*, containing annular piston *k*. The passage *r* providing water pressure from chamber *o* to the space occupied by the annular piston *p*, is also provided at its lower end with the valve *q* which closes or opens an opening *t* for the escape of the pressure in the chamber *p* above annular piston *k*. The valve *q*, is adjustably connected by means of the arms *u* and the link *v* to a fixed point on the frame of the mechanism, the object of this mechanism being such that while the piston *f* is operated on directly from the speed-governor

m and operates directly through the link e to move the water-gate d, that the motion of the by-pass gate g may be made slower or faster than the piston f and the water-gate d, according as the water under pressure in the chamber p is admitted thereto or allowed to escape from fast or slow by the action of the valve q. This construction makes it possible to give to the by-pass valve g a slightly different motion from the motion of the water-gate d, but both of which motions are interdependent one upon the other and act in unison, if not in the same time, and we have then a corresponding motion of the by-pass valve with every motion of the water-gate.

A motion of the water-gate to shut off water from the water-wheel opens the gate in the by-pass, and vice versa.

April 7, 1914. A. M.

By Mr. Westall:

Q. 90. Mr. Cobb, since the last adjournment have you been able to produce any drawing or other illustration showing more clearly the parts of the water governor at Bakersfield not clearly shown in the photographs which had been introduced in evidence as illustrative of the construction of that device at Bakersfield in 1896 and 1897?

Mr. Blakeslee: The same objection with respect to the failure of the alleged Bakersfield plant or Power Development Company plant to come within the pleadings, and as irrelevant, immaterial and incompetent; and it is again to be noted that this objection is urged against any testimony or any purported testimony or evidence with respect to this alleged plant, or any matters con-

cerning it, without the necessity of specifically repeating such objection to each and every question put or at each and every step taken in the proceedings on behalf of the defendant.

A. I have prepared a tracing from which I made several blue prints, one of which I have before me. This blue print shows a plan view, not to scale, of the arrangement of many of the parts of the governing device for water wheel installation at the Power Development Company plant, and is drawn to clarify the location of those parts as shown in the photographs. I have lettered the parts here with the same letters shown on photographs heretofore introduced as exhibits on behalf of the defendant. On this blue print the lines of the governing mechanism shown full represent the position of the parts when the wheels were standing idle, and the position that they assumed whenever water was shut off from the wheels by the main gate in the penstock not shown in this blue print. A few of the parts are shown in another position by dotted lines, which position would be taken when the wheels were operating at something more than half-load—probably three-quarters load. This arrangement of the drawing being introduced simply to give an idea of the relative motions of the parts due to governing action for which the construction referred to on the blue prints was supplied for governing purposes.

Q. 91. By Mr. Westall: This is a plan of the device, is it not?

Mr. Blakeslee: The same objection.

A. A plan view; yes, sir.

Q. 92. By Mr. Westall: The detail drawing at the top of the left hand side of the page, what is that?

A. The detail drawing at the upper left hand corner shows a side view of the connection between the cross-head on the piston rod of the hydraulic cylinder, the rocker-arm R operating the water-wheel gate, and the connecting rod U which operated the by-pass valve J. The detail drawing in the upper right hand corner shows the connection of the connecting rod U through the rocker-arm or crank-arm K to the stem of the by-pass valve J.

Q. 93. Will you please explain a little more fully the action of the different parts when the water having not been turned on is suddenly turned on and the wheels carrying a little more than full load as previously mentioned?

A. The question is put in such a way that it is hard to answer, because the wheel can never carry more than—

Mr. Blakeslee: The same objections are repeated to this line of questions, with the additional objection that this does not call for the best evidence, and no foundation is laid for the introduction of secondary evidence.

Q. 94. By Mr. Westall: Perhaps I can make the question a little more clear. There are dotted lines referred to in your previous answer showing the position of the parts taken on the turning on of the water to the wheel. Will you please describe how the device or the different parts, being at rest, assume those positions and the effect of that changed position upon the water-gate and by-pass valve, referring not only to the drawings now under discussion, but to the other exhibits

which have been introduced as illustrative of this device, if necessary.

Mr. Blakeslee: The same objections, and the objections last noted collectively are to be understood as repeated to all this line of questions, and the further objection is made that the question is indefinite.

A. I would like to have at hand the exhibit showing the outline of the governor construction B. (Defendant's Exhibit M.Z. is produced.) Referring to the blue print before me showing the plan view heretofore mentioned of the position of the governing parts when the wheels were at rest at the time the gates of the water-wheel within the water-wheel case C are wide open, and the governor mechanism shown on Exhibit M.Z. in such position that its levers E are close down to the center of the shaft A, as they can be drawn by the springs S. The bell-crank connection between the levers E, represented in part by the letter L, which connects levers E to collar H, is not shown in either of the drawings; but such bell-crank connection was in existence and operated to transmit the motion of the levers E to and from the center of the shaft A to the collar H, causing the collar H to move longitudinally upon the water-wheel shaft as heretofore testified to. The longitudinal movement of the collar H in the water-wheel shaft caused the upper end of the forked lever I to be moved. Supposing, as heretofore stated, that the positions were all in the position shown by the full lines on the blue print, and that the main gate in the penstock was opened. This main gate is not shown on this blue print, but is shown at E on Defendant's Exhibit Interior of Power Development

Company power house. Then the water having free passage to the wheels will begin to cause revolutions thereof, and such revolutions will increase in rapidity until normal speed for which the governor has been adjusted has been attained. Any increase of speed above that will cause the levers E to throw upward due to centrifugal force and draw the collar H along on the water-wheel shaft to a new position shown by the dotted lines on the blue print above mentioned. When this collar takes this new position, carrying with it the upper end of the forked lever I, it causes the lower end of the forked lever I, as shown on Exhibit ZZ, to move toward the water-wheel cases C, carrying with it the rod V shown on Exhibit ZZ which is connected to the bell-crank M shown on the blue print, and causes the bell-crank M to take the position shown by the dotted lines. This in turn causes the lever N to have first moved the valve-stem O downward, which allows water to enter on the under side of the piston shown by the dotted lines below the letter P on the hydraulic cylinder, causing the piston there shown to rise, we will say, to the position shown by the dotted lines above letter P on the hydraulic cylinder, this motion of the piston carrying floating lever N up to position shown by the dotted lines bringing the valve-stem O, by reason of such motion, back to its original position as shown, and preventing further motion of the piston within the hydraulic cylinder P and holding the water-gates of the water-wheel and the by-pass valve J in proper position to deliver that quantity of water to the wheel which was required to overcome the load at that time being carried. In such position as I have

just described, all the parts in the governor are in balance. The levers E are not in contact with any of the stops provided for restraining its extreme motion or its motion beyond certain limits, but it is floating, as heretofore testified to. And the lever N is in such condition that any motion whatever of the levers EE will immediately move the floating lever N and open or close, so to speak, the valve whose stem is represented by O, and thus admit or allow the escape of water from either side of the piston within the hydraulic cylinder P. Then, it will be seen that, regardless of the position of the parts controlled by the hydraulic cylinder P, the governor has control for the purpose of regulating the speed; and for every new position under any condition of load or speed taken by the levers E, a new position is attained by the piston within the hydraulic cylinder P and, consequently, a new position is taken by the water-gates within the water-wheel cases whose stems are shown by the letter T and the by-pass J through its connection U and its crank-arm K.

Mr. Westall: Counsel for the defendant offers in evidence the blue print referred to and explained in the previous answers, and asks that it be received in evidence and marked "Defendant's Exhibit Cobb Blueprint No. 1."

Mr. Blakeslee: This offer is objected to on all the grounds previously urged with respect to the subject under discussion, and on the further ground that the subject of the purported blueprint is not identified, that the blueprint is not the best evidence, no foundation being laid for the introduction of secondary evidence,

and the alleged subject of the purported blueprint being not shown to exist. If the subject of the blueprint does exist, the blueprint is not, as stated, the best evidence.

Mr. Westall: Counsel for the defendant states that the blueprint referred to has been offered in evidence simply to make clear the witness' previous testimony regarding the construction testified to as having been used at Bakersfield in 1896 and 1897 by the Power Development Company, and has no other purpose than simply to clarify and explain for the benefit of the Court the exact operation of the device referred to.

Q. 95. By Mr. Westall: Referring again to Defendant's Exhibit Swiss Patent, I will ask you to compare, in the light of the translation which has been introduced in evidence, the device of this Swiss patent with that of the Lyndon patent in suit, giving in full your reasons for any opinions you may express.

Mr. Blakeslee: The same objection as urged heretofore against the Defendant's Exhibit Swiss Patent and Defendant's Exhibit Translation of Swiss Patent, and as irrelevant, immaterial and incompetent, notice being again given to counsel for the defendant that no proof has been adduced as to the issuance of any such Swiss Patent or the publication of any of the purported contents thereof.

A. Referring to the drawing attached to the several patents mentioned and to Figure 1 of the Lyndon patent and to Figure 1 of the Swiss patent, a in the Swiss patent is the penstock, corresponding to Figure 1 in the Lyndon patent; d in the Swiss patent corresponds to the water-wheel gate in the Lyndon patent operated by the

valve-stem 21b; valve g in the Swiss patent corresponds to the valve 48 in the Lyndon patent; by-pass passage c in the Swiss patent corresponds to the by-pass passage 47 in the Lyndon patent. All the other mechanism shown for operating the valve d and the valve g in the Swiss patent operates those valves with the same identical results as are attained in the Lyndon patent by all the devices shown in Figure 1 not just mentioned, which operate valve-stem 21b and valve 48 in the Lyndon patent.

Q. 96. By Mr. Westall: I will now ask you, referring specifically to Claim 6 of the Lyndon patent, to compare the device therein described with the Swiss patent referred to.

Mr. Blakeslee: The same objection.

A. Quoting from Claim 6 of the Lyndon patent, "In a water-wheel governor the combination with means for operating the water-gate in either direction, a by-pass for the water-wheel, and a valve controlling said by-pass," in the Swiss patent "means for operating the water-wheel gate in either direction" are shown by the rod e, piston f, its enclosing cylinders, its passages for the introduction or expulsion of water under pressure for operating in either direction the piston f which operates water-gate d in either direction. "A by-pass for the water-wheel" is indicated in the Swiss patent at the letter c; "and a valve controlling said by-pass" is indicated by the letter g which is, in turn, controlled by the piston k to the connection p and the connections h as shown; "of means connected to the water-gate-operating means and operating the by-pass valve inversely to the

operation of the water-gate." The connections just referred to are so arranged that motion of the piston f which controls water-gate valve d also imparts motion to the piston k, which motion may be more or less constrained but which, in turn, controls the by-pass gate g. These motions are such that any motion of the piston f operating to close the water-gate d also operates to open by-pass gate g, and vice versa.

Q. 97. By Mr. Westall: Please now make the same comparison, referring to Claim 7 of the Lyndon patent in suit, and comparing that claim with the device of the Swiss patent to which you have been testifying.

Mr. Blakeslee: The same objection.

A. Referring to Claim 7: "In a water-wheel governor, the combination with means for operating the water-gate in either direction from normal position, a by-pass for the water-wheel, a valve for such by-pass." "Means for operating the water-gate in either direction from normal position" are shown in the Swiss patent by the rod e and piston f with its enclosing cylinder. "A by-pass for the water-wheel" is shown by the passage c leading from the penstock between its main body and the water gate b. "A valve for such by-pass" is shown in the Swiss patent at the letter g. "Of means connected to the water-gate-operating means and adapted to operate the by-pass valve from normal position in either direction" is shown by the links or arms h, the connection P, the piston k enclosed within the previously mentioned piston f, so as to control such valve inversely to the control of the water-gate. The connections, it will be seen are so arranged that any motion of the piston

f operating to close the water-gate d also operates to open the by-pass gate g, and vice versa. Quoting from the Claim, "Means for returning the by-pass valve to normal position on completion of governing movement of the water-gate--operating means". As I have previously testified in reference to that particular statement, it is cloudy to me with regard to its exact meaning; but the only interpretation which I have been able to place upon it is that testified to heretofore, which is to this effect: that for any given load given off by the wheel the water-gate-operating means assumes a certain position. So does the gate of the by-pass g. But in assuming that position or, rather, in hunting for the correct position, they may have momentarily overrun or fallen short of that position, and the action of the mechanism in either of these patents in evidence and under discussion is to bring them into correct position, which is, for the time being, a normal position of the parts for the load at that time being given off.

Q. 98. By Mr. Westall: What effect or result, if any, in water-wheel governing, described by Lyndon, do you find not shown in Swiss patent, to which you have been testifying ?

Mr. Blakeslee: The same objection, and it is objected to as leading and calling for a conclusion.

A. Nothing.

Q. 99. By Mr. Westall: I now call your attention to Complainant's photographic Exhibits E to L, inclusive, and also to Complainant's Exhibits U and V, and ask you to state whether you have heretofore examined those exhibits and whether you understand the machin-

ery and devices therein shown, and the operation and general use thereof.

A. Exhibit E is a photograph showing the interior of a power house.

Mr. Blakeslee: Wait. Let us get a responsive answer. The question should be answered yes or no.

A. Oh, yes; I see. I have.

Q. 100. By Mr. Westall: Will you please again examine said exhibits and state briefly what you understand each to show, stating, if necessary for the sake of clarity, your understanding of the operation and effect of the devices therein disclosed.

A. Referring to Exhibit E, A represents case enclosing the water-wheel; B represents main gate controlling the supply of water to the water-wheels. This gate is inserted in the penstock. D represents a shaft that gives motion to the parts of the governing mechanism; E is the rocker-arm forming a portion of the governing mechanism; F is the frame supporting a portion of governing mechanism; G is a fly-ball governor to operate the speed-controlling mechanism; H is a pulley connected to the fly-ball governor G and receiving its motion from the water-wheel shaft; I is the water-wheel shaft; J represents an electric generator; K is a rod connecting the governing mechanism with the water-gate whose operation will be more fully stated later; L is the stem of the dashpot; M is the adjusting screw of the dashpot; W is a hydraulic cylinder for operating the water-wheel gate; X are connections between hydraulic cylinder W and water-gates. The photograph does not appear clear, but Y appears to be a valve-stem

controlling the supply of oil or water under pressure to the hydraulic cylinder W.

Referring to Exhibit H, QQ is the penstock carrying water to the water-wheel case; PP is a part of the same structure containing the water-operating gate, whose stem is shown at MM; OO is the location of the operating mechanism of the by-pass valve; LL is the shaft carrying the rocker-arm KK which operates the water-wheel gates and by-pass valve; HH is a shaft and rocker-arm connecting the governing mechanism through a connecting rod II to ~~the~~ rocker-arm KK above mentioned; GG are a rack and pinion connected through shaft HH to connecting rod II and rocker-arm KK; FF is the hydraulic cylinder for giving motion to the rack and quadrant GG; DD is a pulley receiving rotary motion from the water-wheel shaft by means of a belt and transmitting same to fly-ball governor CC. At this time I cannot tell whether the letters BB refer to the main operating lever near the arm BB or to the post nearby standing on the rack GG previously mentioned, which operates through lever arms in connection with the dash-pot previously mentioned and shown behind the pulley DD, all of which constitute a returning mechanism.

Referring to Exhibit I, QQ represents the penstock; PP the exterior of the water-gate mechanism of the water-wheel; AA the water-wheel case; WW, OO and SS with pin RR and arms NN below shaft LL operate the by-pass valve; arm NN above shaft LL, in connection with rocker-arm KK and connecting rod II operate main water-gate whose stem is shown at MM.

Referring to Exhibit J, AA represents the enclosing

case of the water-wheel; TT the water-wheel shaft; PP the enclosing case of the water-gate, being also a part of the penstock; NN is the stem of the water-wheel gate; SS is a connection to the stem of the by-pass valve; NN is the lever arm below the shaft LL, operating the by-pass valve; NN, again, above the shaft LL, operates the water-gate of the wheel, both of which move in conjunction with the rocker-arm KK on the shaft LL connected by connecting rod II to the previously mentioned rack and quadrant; FF is a hydraulic cylinder giving motion to the parts just previously mentioned; XX are connections consisting of fixed posts on rack and rocker-arm and piston rod to dashpot, not lettered, whose regulating valve is represented by YY; UU, and VV, represent or are the location of the mechanism connected with the dashpot for bringing about a return to normal position of the water-gate and by-pass valve; CC is the fly-ball speed governor; DD is a pulley receiving motion from the water-wheel shaft TT for operating the fly-ball governor.

Referring to Exhibit K, the several letters refer to the same parts just mentioned as in reference to Exhibit J, this being an enlarged view of a portion of Exhibit J.

Exhibit L is an enlarged view of a portion of Exhibit J, showing water-wheel case AA, water-pressure gauge and pulley TT on the water-wheel shaft.

Referring to Exhibit V, this Exhibit shows an outline drawing of a water-wheel-operating gate; a by-pass valve with its operating mechanism; the gate of the water-wheel and the valve of the by-pass both being operated from connecting rod II attached to lever KK op-

erating about the shaft LL by means of rocker-arm NN, which at its upper end is connected to the water-gate stem MM and at its lower end is connected by means of the pin RR and piston rod UUU which enters dashpot OO; figure 4 are lugs attached to the dashpot cylinder, one of which is on each side of the cylinder, and thus operate the tension rod 2 which passes through said lugs, and they also receive pressure under certain conditions from the springs WW. The dashpot OO is connected by pin 6 and by-pass valve-stem 7. By this construction there is not a fixed or unyielding connection between the piston rod UUU and the by-pass valve-stem 7.

Exhibit U shows mechanism similar to the one just described, but varying in construction details, wherein N represents the stem of the water-wheel gate, U represents the piston rod which, acting through the oil dashpot connects to the by-pass valve-stem, T represents the shaft about which the rocker-arm R, link Q, rocker-arm T and shaft D connect the governing mechanism to the water-gate valve-stem N and the by-pass valve-stem. Other parts shown in this drawing have their names written thereon and are self-explanatory.

Q. 101. By Mr. Westall: Referring now to Complainant's Exhibit HH, the Lyndon patent in suit, and particularly to Claim 1 thereof, I will ask you to compare the construction called for or described in said claim with the Complainant's Exhibits which you have just referred to, and state whether or not you find in said Complainant's Exhibits a device substantially similar or equivalent to that described in said Claim 1, stat-

ing fully your reasons for any conclusions you may express or any opinions you may express.

Mr. Blakeslee: Objected to as calling for conclusions on the part of the witness, and furthermore, that the witness has not qualified to compare the subject of said Claim 1, as an intimate part of the patent in suit, with any other arbitrary devices, with the manifest intention to differentiate. This objection is particularly made with respect to the manifest effect of such inquiry, namely, to interpret the patent in suit or an intimate part thereof. As to any such attempted interpretation the least to be said is that the witness is not qualified.

A. Referring to Claim 1 in the question, and quoting, "In a governor for water-wheels, the combination with a water-gate-operating shaft and a driving-shaft, of a reversing clutch-gear," I do not find the reversing clutch-gear in the exhibits previously referred to. "Adapted to connect the water-gate-operating shaft to the driving-shaft in reverse driving relations," I find no such driving-shaft to connect the water-gate-operating shaft in reverse driving relations. "Means for reversely controlling the operation of such clutch-gear," I find no clutch-gear, and, consequently, no means for reversely controlling the operation thereof. I find no "clutch-gear-controlling means" nor "means for resisting the action of the electro-magnetic device in such manner that at normal speed the clutch mechanism may be disengaged", and I find no such clutch mechanism operated from the driving shaft. I find no clutch mechanism in the exhibits which will operate the water-gate to its operating shaft when speed is increased or decreased from

normal. Further, I do not find any electrical or electrically operated device in connection with Exhibits H, I, J, K or L. Neither do I recognize any such device in Exhibits E, F or G.

April 7, 1914, P. M.

By Mr. Westall:

Q. 102. What is a clutch?

A. A clutch is a mechanism for connecting two parts of a machine so that one of the parts may drive the other. Clutches come under two classes, broadly, one class depending on friction between two surfaces for driving one part of the mechanism from another. I might add further, friction between two surfaces brought into contact with pressure. And another class consisting of interlocking fingers or projections which interlock to transmit motion from one part to another and operate independent of friction in reference to the contact of the parts.

Q. 103. What do you understand by a gear?

A. A gear is a tooth wheel and, in the sense that the word "clutch-gear" is used in Claim 1, being a compound word, would indicate to me that it would be a combination of a gear and a clutch. The drawing shows it to be constructed in that manner.

Mr. Blakeslee: We ask that all that portion of the answer beginning with "in the sense that it is used in Claim 1" be stricken out as not responsive to the question.

Q. 104. By Mr. Westall: Referring then particularly to Claim 1 and to the other claims in which the word "clutch-gear" is mentioned, what do you understand

to be the sense as applied to the device of the Lyndon patent in suit?

Mr. Blakeslee: The objections heretofore made as to the interpretation of this patent and the claims thereof are repeated.

A. As the word occurs in Claim 1 of the Lyndon patent it is a compound word—clutch-gear—and indicates a gear and clutch made in one piece as shown at 10 in Figure 2 of the Lyndon patent and at 9 in Figure 2. There is no such mechanism shown in Exhibits E, F, G, H, I, J, K, or L, examined this morning, for producing the same results.

Q. 105. By Mr. Westall: In the testimony of George J. Henry, Jr., Complainant in this case, question 219 is as follows: “Q—219—Please now indicate and point out in the alleged infringing structures a reversing clutch-gear adapted to connect the water-gate-operating shaft and the driving shaft in reverse driving relations.” The answer to the question is: “A.—The mechanical equivalent of such reversing gear is shown at cylinder FF in Exhibit H and J, and in the reversing cylinder W in Exhibit G.” State whether or not you agree with the conclusions of the witness Henry, and, if not, please state fully your reasons for not agreeing with that answer.

A. I do not agree with it. The hydraulic cylinders shown in these exhibits, that shown on Exhibit H and Exhibit J being the same cylinder but different views thereof, and the cylinder shown in Exhibit G, being a cylinder of another type of the same style of governor, which performs the same functions exactly as cylinder

FF in Exhibit H and Exhibit J, and my remarks will apply with equal force to either one. This hydraulic cylinder is not connected mechanically with the driving-shaft of the water-wheel. This hydraulic cylinder is not the equivalent of a clutch-gear in any sense that can be conceived by myself. The mechanical equivalent of a mechanism like a clutch-gear must be such a mechanism that by practically the use of the same means it shall produce the same result in substantially the same way. There is absolutely no similarity at all in the operation of the mechanism shown in Exhibits J, G and H, and the operation of the mechanism shown by Figure 1 of the Lyndon patent, excepting in so far as that both show means of operating water-wheel gates in connection with valves for by-pass in penstock.

Q. 106. I will now ask you to read the testimony of the witness Henry beginning with question No. 221 to and including question 229, and all of said testimony being relative to the reversing clutch-gear. Please state whether or not you agree with any of the conclusions therein expressed or any of the opinions set forth.

Mr. Blakeslee: We object to counsel putting an arbitrary construction upon any portion of the testimony of the witness Henry or any other witness, and we object to this question further as being an omnibus question and not directed at the sole subject of inquiry, and, therefore, indefinite.

A. I do not agree with a single one of them.

Q. 107. By Mr. Westall: Please state your reasons, briefly for the opinion you have just expressed.

Mr. Blakeslee: The same objection.

A. I can not conceive of any mechanical equivalent in the device shown in Figure 1 of the Lyndon patent in suit, or the Exhibits referred to in the testimony of Mr. Henry; nor can I see the slightest connection on the slightest similarity of operations between the hydraulic cylinder FF mentioned in his testimony and the clutch-gears 9 and 10 shown in Figure 2 of the Lyndon patent in suit. They are in no way similar in operation; they do not produce their results in the same manner nor by similar means nor by the use of similar operating forces, and they are in no sense equivalents the one of the other. There is no position or place in the mechanism shown in the Lyndon patent where the clutch-gears could be removed with their operating mechanism and the hydraulic cylinder FF introduced to produce exactly the same results in the same way as the parts that were removed would perform. Neither is there any part in the Lyndon patent in ^{suit} ~~such~~ which, taken from Figure 1, could be placed in hydraulic cylinder FF in Exhibits H and J and the hydraulic cylinder W in Exhibit G, and perform the same operations performed by this hydraulic cylinder with the piston and piston rod, as the work is performed by this hydraulic cylinder in the exhibits named. The clutch-gears named in the Lyndon patent in suit involve revolution of parts. There is no revolution of parts in the hydraulic cylinder nor its valve, consequently I can conceive of no mechanical equivalence doctrine that can apply in this connection.

Q. 108. By Mr. Westall: Referring now to Claim 2 of the Lyndon patent in suit, I will ask you to compare the device therein described and claimed with the alleged

infringing devices as shown in the different photographic exhibits which have been introduced on behalf of Complainant as illustrative of said infringing device.

Mr. Blakeslee: The same objection as noted previously with respect to the discussion of Claim 1 of the Lyndon patent by the present witness.

A. Quoting from Claim 2 of the Lyndon patent: "In a governor for water-wheels, the combination with a water-gate-operating shaft and a driving shaft, of a reversing clutch-gear, adapted to connect said shafts in reverse driving relations," I do not find in either of the exhibits submitted, namely, Exhibits E, F, G, H, I or J, and reversing clutch-gear or any mechanism which operates in a similar manner to the reversing clutch-gear mentioned in this claim.

Again quoting: "Electro-magnetic means controlling such clutch-gear." There are no electro-magnetic means for controlling anything in the exhibits mentioned.

Quoting again: "A dynamo connected to be driven by the water-wheel and wound so as to deliver an electromotive force varying in a greater ratio than the speed of the water-wheel, a solenoid connected to said dynamo and a device controlled by said solenoid and carrying a contact device, and energizing connections for the electro-magnetic gear-controlling-means, controlled by said contact device." I find none of these devices or solenoids or dynamo or energizing ^{or} ~~connections~~ ^{connections} for the electro-magnetic gear-controlling-means, nor any mechanism controlled by said contact device, nor any equivalent therefor in Exhibits E, F, G, H, I, J, K or L. I do not find any mechanical equivalent of these devices. The only

parts mentioned in this combination claim which may be considered as occurring in the exhibits mentioned, are the water-gate-operating shaft and the driving-shaft and no other parts mentioned in said claim; and the other parts mentioned in said claim do not occur in the exhibits shown.

Q. 109. By Mr. Westall: Referring now to Claim 3 of the Lyndon patent in suit, please make the same comparison with the photographs and other exhibits of the alleged infringing structure, giving fully your reasons for any opinion you may express.

Mr. Blakeslee: The same objections as last noted.

A. Quoting from Claim 3: "In a water-wheel governor, the combination with a water-gate-operating shaft, and means for operating same in either direction to govern the water-wheel, of a controller for said operating means, responsive to changes of speed of the water-wheel,"

Mr. Blakeslee: Let the record show that the witness who has testified he has fully and carefully examined the patent in suit and the exhibits referred to has halted in his answer at the beginning of this observation a minute and a half, during which he has apparently attempted to frame an answer.

Mr. Westall: We deny that the witness has withheld his answer and deny that counsel looked at his watch or has any means of estimating the length of time that the witness has taken.

Mr. Blakeslee: Counsel held his watch and inspected it for a minute and a quarter of the time charged, and estimates that at least a half a minute expired before he

took his watch from his pocket, and we are still waiting for the answer.

Mr. Westall: Has counsel taken into consideration the time that was spent by the Examiner at the telephone?

Mr. Blakeslee: That was prior to my first remark on the record, during which no word was spoken by anyone present excepting some remark which could not be followed and which the witness apparently directed to counsel.

A. "In a water-wheel governor, the combination with a water-gate-operating shaft, and means for operating same in either direction to govern the water-wheel" are shown in Exhibit J as follows: The water-gate-operating shaft may be shaft LL in Exhibit J or shaft HH in Exhibit H, and "means for operating same in either direction to govern the water-wheel," "means for operating same in either direction to govern the water-wheel," "~~means for operating same in either direction to govern the water-wheel~~" are shown by the hydraulic cylinder FF in Exhibit H and Exhibit J. "Of a controller for said operating means, responsive to changes of speed of the water-wheel." In Exhibits J and H the only mechanism responsive to changes of speed in the water-wheel are the fly-ball governor CC in Exhibit H and CC in Exhibit J.

"A returning device for said controller" is not found in connection with the controller responsive to changes of speed CC, because the positions of the parts of CC assumed for any given speed remain the same, while the speed remains the same, and there is no return until

the speed has changed, and hence I do not find the returning device for said controller.

“Provided with a clutch connection to said operating-shaft.” There is no clutch-connection between the controlling device CC and the operating shaft LL.

There are no means shown in this exhibit “actuated by said controller on movement thereof from normal position to engage said clutch with the said shaft, so as to cause the return of the controller to normal position and interrupt the governing action before it has overrun the proper amount.” There is no “clutch with said shaft”, and consequently there is no return of the controller to normal position; and in the exhibits shown there is no return to normal position of the parts of the fly-ball governor CC without a change of speed. All the parts mentioned in Claim 3 as being in combination are not to be found in the Exhibits H and J in combination to act in the same way or in substantially the same way by similar mechanism; nor is the mechanism described in Claim 3 in any sense an equivalent of the mechanism for producing similar final results as shown in Exhibits H and J.

Q. 110. By Mr. Westall: Referring now to Claim 4 of the Lyndon patent in suit, please make the same comparison with the photographs and other exhibits showing the alleged infringing devices, and state whether or not in your opinion the same elements or groups of elements are found as called for in the claim referred to.

Mr. Blakeslee: The same objection as noted to the last question concerning Claim 3.

A. Quoting from Claim 4: "In a water-wheel governor, the combination with a water-gate-operating shaft, a driving-shaft and reversing clutch-gear," I find a water-gate-operating shaft in Exhibit J at LL; also at LL on Exhibit H.

"A driving shaft" I do not find in either of the exhibits or in any of the exhibits submitted by Complainant, and "a reversing clutch-gear", I do not find a reversing clutch-gear.

"Adapted to turn the water-gate-operating shaft in either direction." There is no such clutch-gear adapted to turn the water-gate-operating shaft in either direction.

"A controller, responsive to changes of speed of the water-wheel and controlling such reversing gear". There is a controller responsive to the change of speed in the water-wheel at CC in Exhibits H and J but it does not control a reversing or reversing-clutch-gear.

"And a returning device for said controller provided with actuating means controlled by said controlling means to return the controller to inoperative position." There is no returning device in the speed-measuring device CC in Exhibit J and CC in Exhibit H which returns to a former position by any other means than a change of speed.

"Provided with actuating means controlled by said controlling means to return the controller to inoperative position." I find no mechanism in the device for controlling the motions within the hydraulic cylinder in Exhibits H and J which correspond to similar mechan-

ism or with any mechanism shown in Figure 1 of the Lyndon patent in suit, and as described in this claim "by said controlling means to return the controller to inoperative position, so as to prevent excessive movement of the governor." I do not find any equivalent in the means for connecting the speed-controller CC with the hydraulic cylinder FF in Exhibits J and K with the means shown in the Lyndon patent for controlling the motion of the water-wheel gates between said gates and the specially wound dynamo for controlling the speed. There is no similarity whatever in the mechanism shown in the exhibits and the mechanism described in the patent either with regard to the means employed or principles of operation, and they are neither one the mechanical equivalent of the other, both showing an entirely distinct and different method of controlling the gates of the water-wheel in conjunction with the control of the gate of the valves in the by-pass from the penstock carrying water to said water-wheel.

Q. 111. By Mr. Westall: Please now make the same comparison as to Claim 5 of the Lyndon patent in suit with the alleged infringing devices as exemplified in photographs and other exhibits introduced on behalf of the Complainant.

Mr. Blakeslee: The same objection as noted with respect to the question calling for similar comparisons of Claims 1, 2, 3 and 4.

A. Quoting, "In a water-wheel governor, the combination with a water-gate-operating shaft, a driving-shaft and a reversing clutch-gear, adapted to connect

said shafts so as to cause the water-gate-operating shaft to move in either direction, a dynamo operatively connected to produce an electro-motive force responsive to the speed of the water-wheel, a solenoid device energized by said dynamo, a core for said solenoid and a circuit-controller actuated thereby, springs for holding the circuit-controller in normal position, two electro-magnetic devices for reversely operating the reversing clutch-gear, a returning device adapted, when operated, to return the circuit-controller to normal position, a clutch adapted to bring said returning device into operative connection with the water-gate-operating shaft, a magnet controlling said clutch and a circuit for said magnet including a circuit-closer operatively connected with the aforesaid circuit-controller and adapted to energize said magnet on movement of the circuit-controller in either direction."

The only two parts mentioned in this combination which I can discover in use in the Exhibits H and I previously mentioned, are the water-gate-operating shaft and a driving-shaft. Every other specific piece of mechanism mentioned in the combination of Claim 5 is not found at all in the mechanism shown in Exhibits H and J. The reversing clutch-gear mentioned in Claim 5 is not found in the Exhibits; neither is there any device found therein operating in substantially the same manner as the reversing clutch-gear. There is no dynamo to be found in Exhibit H nor Exhibit J, no solenoid, no core for said solenoid, no circuit-controller, no springs holding the circuit-controller, no electro-magnetic device for reversely operating the reversing clutch-gear. There

is no reversing clutch-gear. There is no returning device adapted when operated to return the circuit-controller. There is no circuit-controller in the exhibit. There is no clutch in the exhibit adapted to bring the said returning device into operating connection with the water-gate-operating shaft, nor is there any magnetic control set forth, nor any circuit for said magnetic control including a circuit closer, nor are there any such devices ^{and} operatively connected with the aforesaid circuit-controller adapted to energize said magnet on movement of the circuit-controller in either direction.

Mr. Blakeslee: In addition to the objections registered against the questions which have been put as to the comparison of the subjects of Claims 1, 2 and 5 with the various exhibits of Complainant, the attention of the Court is called to the admission of the present witness that he is not skilled in electrical matters or electrical engineering.

Q. 112. By Mr. Westall: Referring now to Claim 8 of the Lyndon patent in suit, please make the same comparison with the alleged infringing devices as exemplified in the photographic and other exhibits introduced on behalf of Complainant, as illustrative also of the infringing devices.

Mr. Blakeslee: The same objection is noted as was noted with relation to the questions relating to these comparisons of the subjects of the claims of the patent.

A. Quoting from Claim 8. "In a water-wheel governor, the combination with a shaft for operating the water-gate in either direction from normal position, a by-pass for the water-wheel and a valve for such by-pass

normally held in partly open position, of an operating device for said valve provided with means for returning the valve to normal position, a clutch, adapted to connect said operating device for the by-pass valve with the water-gate-operating shaft to control the by-pass valve inversely to the water-gate, reversing means for operating the water-gate-operating shaft in either direction, a controller, responsive to the speed of the water-wheel and controlling said reversing means, and means operated by said controller to bring the aforesaid clutch into operation and to release said clutch when the governing action is effected." I find in Exhibits H and J a water-gate-operating shaft which will operate the water-gate in either direction from normal position; I find a by-pass for the water-wheel on Exhibit U and a valve for such by-pass also on Exhibit U, an operating device for said valve, shown on Exhibit U. "A clutch adapted to connect said operating device for the by-pass valve with the water-gate operating shaft" is not found in Exhibits H nor J nor U. Exhibits H, J and U show a mechanism adapted to connect said operating device for the by-pass valve with the water-gate-operating shaft, and to control the by-pass valve inversely to the water-gate which is constructed and operates entirely independent of any clutch-mechanism. "Reversing means for operating the water-gate-operating shaft in either direction" is found in Exhibits H and J. "Controller responsive to the speed of the water-wheel" is found at CC in Exhibits H and J, this controller being responsive to the speed of the water-wheel and controlling said reversing means. "Means operated by said controller to bring aforesaid

clutch into operation" are not found in the Exhibits H, J or U, nor do these exhibits show any mechanism to release said clutch when the governing action is effected.

Q. 113. By Mr. Westall: Referring now to Claim 9 of the Lyndon patent in suit, please compare the device therein claimed and described with the devices illustrated and shown in Complainant's Exhibit Photographs and Drawings of the alleged infringing device.

Mr. Blakeslee: The same objections as previously noted to the previous questions concerning these comparisons of the parts of the claims.

A. Quoting: "In a water-wheel governor, the combination with a shaft adapted to operate the water-gate in either direction from normal position, a by-pass for the water-wheel and a valve for such by-pass, normally held in partly-open position, of means adapted to operate said valve in either direction and provided with means for returning the valve to normal position, a clutch adapted to connect such operating means with the water-gate-operating shaft, a driving-shaft and a reversing gear for turning the water-gate-operating-shaft in either direction, a dynamo connected to the water-wheel, so as to be responsive to the speed thereof, an electro-magnetic device connected to said dynamo, a controller operated by said electro-magnetic device and controlling the said reversing-gear, a magnetic device controlling the aforesaid clutch for the by-pass operating-means, a circuit for said magnet and means operated by said controller in its movement in either direction to close such circuit." In Exhibits H and J we find a shaft adapted

to operate the water-gate in either direction. In Exhibit U we find a by-pass for the water-wheel and a valve for such by-pass. We find means adapted to operate these valves in either direction. We do not find in these Exhibits any clutch adapted to connect such operating means with the water-gate-operating shaft. We do not find any driving shaft and a reversing gear for turning the water-gate-operating shaft in either direction. We do not find any dynamo connected with the water-wheel so as to be responsive to the speed ~~theory~~, *there*, nor any electro-magnetic device connected to said dynamo, nor any controller operated by said electro-magnetic device and controlling said reversing-gear, nor any magnetic device controlling ~~said reversing gear, nor any magnetic device controlling~~ the aforesaid clutch for the by-pass operating means, nor any circuit for said magnet, nor any means operated by said controller in its movement in either direction to close such circuit, nor do we find any device for operating the water-gates by a driving-shaft as above mentioned, nor do we find the mechanical equivalent of any of these electrical devices mentioned. A mechanical equivalent of such electrical device must perform its functions by substantially the same means, in substantially the same manner, and produce substantially the same results as those employed in the claim. None of such devices appear in the exhibits.

Q. 114. By Mr. Westall: I now call your attention to the testimony heretofore taken on the part of the Complainant of C. L. Cory, beginning at question 326 on page 331 of the record, and ask you to read that tes-

timony down to and including question and answer No. 334 on page 333 of the record, and state whether or not you agree with the opinions therein expressed and, if not, to state your reasons for any disagreement which you may express.

Mr. Blakeslee: Objected to as being an omnibus question and not calling for an answer on a single definite issue, and, therefore, as being indefinite; that it is calling for mere conclusions on the part of the witness and not a proper method of proof. And, furthermore, it is further objected to in so far as it involves the electrical features with which sort of questions the witness has stated he is not familiar with or, at least, not skilled in the consideration of. And on the further ground that the witness has not qualified as to such part of the question as relates to any comparison of the subjects of any of the claims of the Lyndon patent in suit as such.

A. I do not agree with the opinions expressed in the testimony just read for the reason that I do not consider the mechanism shown on blueprint KKK the mechanical equivalent of the mechanism shown in Figure 1 of the Lyndon patent in suit, because there are no parts shown on the blueprint KKK which operate using substantially the same means, operating in substantially the same manner to produce substantially the same results. On the blueprint there is absolutely no mechanism involving any electrical contacts, electrical circuits; there are no parts involving the use of solenoids or magnets; the parts are entirely mechanical and hydraulic in their operation; there are no frictional or tooth clutch-gears and the parts shown on blueprint KKK are in no sense nor

in any sense the mechanical equivalent of the parts illustrated in Figure 1 of the Lyndon patent. An illustrative of this condition, the speed-operated element, fly-ball governor marked C on the blueprint KKK is in no sense whatever the mechanical equivalent of the specially wound dynamo marked 8 in the Lyndon patent. The valve-operating shaft marked F' on the blueprint marked KKK is in no sense similar in its operation to the valve-operating-shaft 49 and 20 of the Lyndon application. The shaft F, as shown in blueprint KKK, is simply a rocker-shaft and at no time makes a complete revolution. It is in the usual sense not an operating shaft at all; it is simply a rocker-shaft for transmitting motion between two arms attached thereto and is not a shaft for transmitting motion as indicated by No. 20 or No. 49 in Figure 1 of the Lyndon patent. These examples, I believe, are sufficient to illustrate my contention that the devices indicated on blueprint KKK are not the equivalent of the devices shown by Figure 1 of the Lyndon patent in suit.

April 8, 1914, A. M.

Q. 115. Mr. Cobb, you testified as to the state of the art prior to the date of the application for the patent in suit. You mentioned a certain governing device in use at the North Star Mine at Grass Valley. Can you produce any drawing or pictorial representation showing the device described generally by you in answer to previous questions?

Mr. Blakeslee: Objected to as not within the pleadings, no mention of any such installation being made in

the answer in the case, and that it is irrelevant, immaterial and incompetent.

A. I can.

Q. 116. By Mr. Westall: Will you please produce the drawing showing such device, and after producing it, please explain the operation, object and effect of the device, making any comparisons you may think necessary with other devices which have been described by you, for the sake of clearness, and stating in full your reasons for any opinions you may express.

Mr. Blakeslee: The same objections, and these objections will be considered as repeated to all testimony offered on this line of questions.

Mr. Westall: It is pointed out by counsel for the Defendant that this evidence is only introduced in corroboration of the testimony of the witness as to the state of the art, and, therefore, does not need to be specially pleaded in the answer.

A. I have before me a blueprint of a drawing that was dated September 3, 1898, covering the construction of a nozzle and governor for a 5-foot water-wheel for the North Star mines in Grass Valley, California, and made in the office of Cobb & Hasselmeyer, mechanical and hydraulic engineers. This drawing illustrates one of several installations that we set up for the North Star Mining Company, and is illustrative in a general way of all the constructions that they installed at that time. Before proceeding to letter the blueprint, I wish to state that the problem to be solved by the construction shown on this blueprint was to regulate the speed of a water-wheel. The water-wheel was located at the lower end of

a long penstock or pipe-line which, I have previously testified, had taken from it many other supplies of water to isolated water-wheel plants, which were opened and closed frequently, and all of which tended to produce an extreme variation of pressure in the water at the lower end of the penstock where this particular installation was located. Consequently the pressure of the water in the penstock at this location was affected not only by the quantity of water which passed through the particular gates shown on this drawing at any instant, but was affected by the quantity of water passing through the gates of water-wheels located sometimes more than a mile distant from this same installation. Consequently, it was impossible to attach directly to this installation or to this governing mechanism, which was provided to regulate the speed of the water-wheel, a mechanism to maintain uniform pressure in the penstock, because that pressure, as heretofore stated, was caused to vary by forces outside of this individual construction. Consequently, it was necessary to devise some scheme independent of water-wheel speed governor for controlling the pressure in the penstock. With that understanding in mind, I will represent the penstock in this installation by the letter A, the water-gate for water-wheel, B. The fly-ball governor for indicating changes of speed is represented by C. The hydraulic cylinder for operating water-wheel gate is represented by D. F represents the valve controlling supply to the hydraulic cylinder D. E represents a floating lever. Let H represent the arm connecting the piston of the hydraulic cylinder D with the connecting rod I leading to the rocker-shaft J, con-

necting to the speed governor by the link K, said link K connecting with the end of the floating lever E opposite to the end of the lever E which is connected to the fly-ball governor C. The operation of this mechanism in practice was as follows: Suppose the mechanism in operation, that is to say, water being supplied from penstock A, water-wheel W through water-gate B, which is partially open as shown in the end view at X. The speed-governing mechanism C will then be revolving with its parts in a certain position. Suppose now that the load on the water-wheel W be decreased and its speed tends to increase. Then the centrifugal elements, the balls in the governing mechanism C, would fly outward and would cause the left hand end of the floating lever E to be depressed which, acting upon the balance line valve F, would cause water under pressure passing through said valve to enter beneath the piston in the hydraulic cylinder D, causing the piston to rise and close or partially close the water-gate B. When the piston in the hydraulic cylinder D rises, it carries with it the long pin at H; connected to the outer end of this long pin it carries with it the connecting rod I connecting to the rocker-arm J which in turn, by means of the connecting rod K, is connected to the right hand end of the floating lever E. The upward motion of the piston then closing the gate would tend to raise the right hand end of the floating lever E cutting off the water supply from the lower side of the piston, holding the water-gate at a proper position for the proper supply of water to the water-wheel w. If the wheel, being in operation under normal condition of speed and load, had its load suddenly increased

instead of decreased as just illustrated, the operations just heretofore explained would take place reversely. That is, so as to supply more water to the wheel. This mechanism operated to control the speed of the wheel in the most satisfactory manner when the pressure in the penstock was uniform within reasonable limits. But, as heretofore stated, that uniform pressure in the penstock was impossible at all times and for the reasons stated. Consequently, an additional device was provided on the penstock of this installation which would regulate the pressure within from three to five pounds of normal under all conditions of the flow of water in the penstock, and, as I have heretofore stated, that mechanism had to be independent of the mechanism shown on this blueprint, because of the forces acting in the penstock to cause increase or decrease of pressure therein were applied to the penstock at points remote from this particular installation.

Q. 117. By Mr. Westall: To further aid in explaining to the court the operation of the last mentioned device, can you produce any circular or pictorial representation of any part of the device?

A. I can. I can show an illustration of the complete device.

Q. 118. Will you please produce the same and explain fully the operation of the device therein shown?

Mr. Blakeslee: The same objections as last noted.

A. I have here a circular published at my instigation as the senior member of the firm of Cobb & Hasselmeyer, setting forth a device that I designed for maintaining practically uniform pressure in the penstock in the instal-

lation just described, and which device was applied to many other penstocks for accomplishing the same purpose. The circular that I have here is descriptive of this device and explains its objects and operation quite fully. But I will say that in this device the penstock is represented by the letter A, and air-chamber above the same is represented by the letter Z; between the air-chamber Z and the penstock A there is introduced an auxiliary valve body represented by the letter Y, containing therein a check-valve X. At one side of the chamber Y there is provided a by-pass outlet V controlled by the automatic pressure-valve W. In some cases several of these outlets were provided on the air-chamber Y. In the illustration only one such outlet is shown. The operation of this device was as follows: At a time when the pressure in the penstock A was considered normal, the automatic valve W was adjusted so as to just maintain that pressure without opening to discharge water, and the water would stand with its upper level in the air-chamber at some point as indicated by the dotted line S, and the check-valve X would be closed, and all the parts ^{standing} ~~being~~ in balance. That is to say, the pressure of the water in the penstock A and the pressure of the air in air-chamber Z above the surface S of the water would be the same, and the valve W was so adjusted as to just prevent that pressure from allowing any flow through the by-pass V. If from any cause due to shutting off of water suddenly or the entrance of water suddenly into the upper end of the penstock, the pressure therein was increased, that pressure would first act to raise the check-valve X, compressing the air in

Z above the surface S of the water in the air-chamber, and the surface S would rise to a new position indicated by the dotted line S', compressing the air in the air-chamber Z above this new surface S' to a higher pressure than the automatic pressure-valve W was able to hold. The consequence would be that at the instant that flow through the valve X ceased by reason of the impulse given to same from the pressure in the penstock A, that it would close by its own weight, and the increased pressure of the air in the upper part of the air-chamber Z would cause the automatic valve W to open and the water that had been entrapped in the air-chamber Z between the surfaces S and S' would be discharged through this automatic valve to the passageway B, and the whole mechanism instantly became returned to its normal position and became ready for operation. This device then just explained was applied to the penstock for the governing mechanism shown on the blueprint heretofore mentioned as being a nozzle and governor for a 5-foot water-wheel at the North Star Mine, and it gave very satisfactory results under all conditions prevailing, and is an illustration of the state of the art at that time in the endeavor of those working therein to devise such mechanism as would maintain uniform pressure in the penstock irrespective of quantities of water being used on water-wheels at any instant.

Mr. Westall: Counsel for the Defendant offers in evidence the blueprint just previously spoken of as "Defendant's Exhibit Nozzle and governor for North Star Mines, Grass Valley, California, September 3, 1898. Sheet 27."

Counsel for Defendant also offers in evidence the circular just referred to by the witness as "Defendant's Exhibit Cobb Pressure-regulating Device Circular."

Mr. Blakeslee: After the offer of the first of the two Exhibits just tendered, we object to the Exhibit as it manifestly is not a nozzle and governor; in the second place, we object to this blueprint ^{as} being offered in evidence on the ground that it is not identified, is not the best evidence, no foundation has been laid for the introduction of secondary evidence, no proof of what may have or may not have been included in the alleged installation purported to have been installed in 1898 at Grass Valley, California. And, further on the grounds ^{other} heretofore urged in connection with the testimony of the witness concerning this alleged installation, that it does not come within the pleadings in this case, no mention of the same having been made in the answer of the Defendant. And, finally, therefore, that the same is irrelevant, immaterial and incompetent, and not concerned in any way in proving any of the issues involved in this suit.

As to the second of the two Exhibits just offered, we object to such offer on the ground that it likewise does not come within the pleadings in the case, not being mentioned in the answer of the Defendant herein, not being proven, not being the best evidence, no foundation being laid for the introduction of secondary evidence, not the best evidence and not proof in any capacity of any of the things purported to be disclosed in such circular. Further, that it is irrelevant, immaterial and incompetent, and not proper proof in any respect in this case.

Mr. Westall: As before stated, the Exhibits referred

to in the objection of counsel are introduced only to show the state of the art prior to the Lyndon application, and, therefore, it is not necessary that they be specially pleaded.

Mr. Blakeslee: This is an action in equity, and the last paragraph of Section 4920 of the Revised Statutes provides as to the notice to be given to Complainant in patent suits in cases in equity, and no such notice was given to Complainant as to these alleged prior devices under discussion.

Mr. Westall: It is not necessary to go into an argument as to the provisions of Section 4920. Counsel for the Defendant is perfectly familiar with the Section and with the Decisions thereunder.

(The said Exhibits so offered in evidence are thereupon marked respectively:

("Defendant's Exhibit Nozzle and Governor for North Star Mines, Grass Valley, California, September 3, 1893. Sheet 27". and

("Defendant's Exhibit Cobb Pressure-regulating Device Circular", together with the title of the court and cause and the date upon which the said respective Exhibits were offered in evidence.)

Q. 119. By Mr. Westall: Referring now to Defendant's Exhibit Cobb Pressure-regulating Device Circular, I will ask you to state when that circular was published, if you know.

Mr. Blakeslee: The same objections as previously noted in regard to this exhibit, and also on the ground that it is leading, and does not call for the best evidence as to the publication.

A. I don't remember exactly, but I think after July 1897 on account of the fact that it contains extracts from an article published by The Engineering News of New York, July 8, 1897.

Q. 120. By Mr. Westall: When did you first put that device into operation?

Mr. Blakeslee: The same objection.

A. I cannot recall the exact date. It was put in at the Grass Valley plant, it was put in at the Palace Hotel, it was put in on the Blue Lakes Water Plant, all those installations being right along in a bunch about the time this circular was issued, and I have not at hand anything right at this minute that would indicate exactly the date, and I don't remember them otherwise.

Q. 121. By Mr. Westall: Do you remember the year?

Mr. Blakeslee: The same objections, and the previous objection to any of this line of testimony are repeated without further specifically repeating them.

A. The Grass Valley installation must have been about October, 1898, to the best of my knowledge and belief. The installation in the Palace Hotel was prior to that, to the best of my memory, and the installation at the Blue Lakes I do not recall at this time but I can discover it from my notebooks. It was in the same general time, but the exact date I believe I could recall from my notebooks which I believe I have not here with me.

Q. 122. By Mr. Westall: State whether or not the device forming the subject matter of Defendant's Exhibit Cobb Pressure-regulating Device Circular and the blueprint which you have previously explained, was a

successful and operative device, and whether or not it fulfilled the purposes for which it was designed.

Mr. Blakeslee: Objected to as leading and calling for a conclusion.

A. It was operating successfully to my certain knowledge the last time I was at the Grass Valley installation.

Q. 123. By Mr. Westall: How long ago was that?

A. In the fall of 1898.

Q. 124. Assuming, contrary to your previous testimony and to the testimony of some ^{of} Complainant's witnesses, that the Lyndon patent in suit discloses an operative and practical device, what do you understand to be the essence of the invention or the main principle upon which ~~the~~ Lyndon was working in producing this device?

Mr. Blakeslee: Objected to as calling for an arbitrary interpretation of the Lyndon patent and of the disclosures thereof, and for conclusions, and, further, on the ground that as to any such arbitrary and sweeping conclusion or attempted interpretations of letters patent, the witness is not qualified.

Q. 125. By Mr. Westall: And in doing so, I will ask you to state your reasons in full for any opinions you may express.

Mr. Blakeslee: The same objection.

A. From the reading of the Lyndon patent I reached the definite conclusion that the object of his device was to maintain a constant flow and incidentally a constant pressure in the penstock without regard to the quantity of water being supplied directly to the wheel at any instant. He had without doubt knowledge of the fact that a sudden opening of the water-wheel gates instantane-

ously reduced the pressure in the penstock in the immediate neighborhood thereof, and that a sudden closing of the water-wheel gate increased the pressure in the penstock in the immediate neighborhood thereof, and in an effort to prevent this fluctuation of pressure due to the action of the water-wheel gate, he introduced the by-pass. Consequently, my view of the effect is as stated,—that the prime object of his device was to maintain uniform pressure in the penstock, irrespective of the quantity of water being supplied to the water-wheels at any instant.

Q. 126. By Mr. Westall: Referring now to Defendant's Exhibit "Cobb Pressure-regulating Device Circular," and Defendant's Exhibit "Nozzle and Governor for North Star Mines, Grass Valley, California, September 3, 1898, sheet 27", and the device therein shown and disclosed which you have heretofore described, please compare the object and purpose of such device with that of the Lyndon patent as to the objects and results accomplished and sought to be accomplished.

Mr. Blakeslee: Objected to as calling for a conclusion and not for a comparison of working structures, and the functions thereof.

A. From my experience with a prior installation of water-wheels at the same location and on the same penstock as was located the water-wheel and nozzles shown in the Exhibit, I was aware of the conditions prevailing there wherein the pressure in the penstock was exceedingly variable, and at the time when the question arose as to the installation of further water-wheels in this same plant, I devoted attention to the problem of regulating

the pressure in the penstock, or, in other words, overcoming the ram action therein due, as I have previously testified, to the handling of other water-wheels from the same water supply and from the same penstock. There was already on the penstock at the Grass Valley installation a large air-chamber, which was common to apply to such installations at that time. I turned my attention in an effort to make the air-chamber on the one designed for providing an elastic medium for handling the excess pressure. So at this installation at Grass Valley I designed the device shown in "Defendant's Exhibit Cobb Pressure-regulating Device Circular" to fit in between the air-chamber that was then in place on the penstock of the Grass Valley installation and the penstock itself. Now, the object of that device was in connection with the operating mechanism of the nozzles and gates of the water-wheels to maintain, as far as possible, a uniform pressure in the penstock, regardless of what the nozzles were doing on the particular wheels in this particular installation or regardless of what the nozzles were doing on the other wheels on other installations that were taking their water supplies from the same penstock. As I have previously stated, it was impossible under the conditions to design a proper device for regulating this pressure which was immediately or directly attached to the governing mechanism of the water-wheel, because they were not the only water-wheels using water from this penstock, and, consequently, were not every time the initial cause of the fluctuation of the pressure. The operation in practice was as had been hoped for, that an increase in pressure sufficient to cause the automatic

valve W to open in the penstock would cause it to open and prevent a serious increase of pressure in the penstock, and it assisted in regulating the water-wheels in that it did not require the governors to make so many movements for the purpose. The objects of the device shown in these two exhibits was identical with the object shown in the construction of the Lyndon patent, being the question of maintaining, as far as possible, a uniform pressure in the penstock, regardless of the quantity of water being used by the water-wheels at any instant.

Mr. Westall: So far as I can now say, this completes the direct examination of the witness; but the right to recall the witness is reserved if it may be necessary to produce other matters which have not yet been received. You may cross-examine.

CROSS-EXAMINATION

By Mr. Blakeslee:

Mr. Blakeslee: Reserving all the objections noted of record as to the several purported defenses or several purported matters presented by the defense, which Complainant contends do not come within the pleadings of this case, notice of the same not being given in the answer, and which, at the final hearing, it will be contended cannot be considered by the Court, and as to which reference is made to the record on the direct examination of this witness, and all of which things are therefore contended to be irrelevant, immaterial and incompetent and not concerned in any of the issues presented in this suit, I will proceed to cross-examine the present witness. But such cross-examination is not to be considered as a con-

fession that any such mentioned things have been properly brought into or admitted to be brought into this case by the defendant. I so cross-examine as to these matters, with other matters, if there be such, coming within the pleadings of this case, for the reason that the Defendant has given notice of a certain motion to amend the answer, such motion not having as yet been disposed of by the Court. Although such motion will be opposed, a ruling upon the same will, of course have its due effect upon the past and present procedure in this case. Similar reservations are made as to the objections registered with respect to the other matters presented by the Defendant, in cross-examining this witness, all of such objections being also reserved in connection with this cross-examination of the present witness. Such objections include the objection registered with respect to the testimony relating to the Defendant's Exhibit Lamb Patent, and to such exhibit, namely, that such Lamb patent is pleaded in the answer as a prior publication, and not as a matter of fact. The exhibit shows upon its face that the purported publication of this Lamb patent is not a publication prior to the date of the invention of the Lyndon patent in suit.

Q. 127. Referring to Defendant's Exhibit Lamb Patent, Mr. Cobb, is there any one gate in this Lamb patent disclosure which controls all of the nozzles supplying water to the wheel?

A. Not that is operated on by the governor. There is a main gate probably let into these penstocks that, I presume, is left out of all discussion here.

Q. 128. Does the Lamb patent show at any place or

describe at any place any one gate which controls all of the wheel-nozzles 6?

A. It does not.

Q. 129. Is there anything then disclosed in the Lamb patent which enables the governor ^{ing} of the water supply to the wheel or the buckets on the wheel through all these nozzles?

A. There is nothing shown in the Lamb patent determining the water in all the nozzles; but the object of the Lamb patent was to produce such a construction as would govern the speed of the wheels uniformly, and the governing of the wheel at uniform speed is effected by the use of the nozzles 7 and 8 there shown.

Mr. Blakeslee: We will ask that all that portion of the answer following the first sentence be stricken out as not responsive, and will ask the witness to confine his answers to the questions. If he wishes to elaborate any answer he may do so; but I will ask him kindly not to volunteer any statement which does not come fairly within the question.

Mr. Westall: Counsel for the defendant insists that the answer given by the witness is an elaboration of his answer and is within the terms of the question asked.

Mr. Blakeslee: The question speaks for itself.

Q. 130. How many nozzles do you find in the Lamb patent disclosure?

A. Five operating to revolve the wheel in the direction of doing work, and one operating to retard such motion.

Q. 131. And as to these five mentioned, how many have any gate device?

A. One.

Q. 132. And, therefore, I take it, there is nothing shown in this Lamb patent device which enables more than approximately one-fifth of the water passing to the wheel nozzles to be shut off, that is, water which is applied for positively or directly rotating the wheel? Is that correct?

Mr. Westall: Counsel for the defendant objects to the question in that the patent itself states that less than five nozzles or any number of nozzles may be employed, and that the patentee does not limit himself to any particular number of nozzles.

Mr. Blakeslee: We object to counsel coaching the witness. The witness can refer to the patent as much as he wishes without any assistance.

A. Only one-fifth can be cut off as applying directly to give force for the operation of the wheel in normal direction. But at the time that this $1/5$ is cut off from operating on the wheel in its normal direction, another one-fifth is discharged upon the wheel in a direction to retard its revolution, and, in that respect, has the effect to act upon the wheel as if more than one nozzle of the driving nozzles had been closed off, so far as regulating the speed of the wheel is concerned.

Q. 133. Wouldn't it be more correct to say another one-sixth than another one-fifth?

A. The maximum power of the wheel is given by the five nozzles, and two of them can be so manipulated that when one of the five nozzles is entirely closed off an auxiliary nozzle may be made to discharge water against the wheel in an opposite direction to its normal revolution,

this retarding that revolution in much the same manner as revolution would be retarded by partially cutting off another of the five nozzles, which is not shown to be provided with a special device therefor.

Q. 134. Now, assuming that the one driving nozzle is cut off and what is referred to in the Lamb patent at line 50, page 1, as the brake nozzle is opened up, you will have one nozzle acting to retard the wheel and four nozzles acting to positively impel it, will you not?

A. Yes, sir.

Q. 135. Now, in the Lyndon patent there is but one gate valve disclosed, is there not, aside from the by-pass valve?

A. The gate valves are all operated from one shaft, 21b, in the Lyndon patent.

Q. 136. And any operation of the shaft 21b in the Lyndon patent affects any gate valves there may be in that construction? Is that not correct?

A. I assume that to be correct.

Q. 137. You don't find anything in the patent to the contrary?

A. Nothing found in the patent to the contrary. The details of the gates are not shown, but that would be reasonable to presume to be the fact.

Q. 138. So that I take it there is this distinction between the Lamb patent disclosure and the Lyndon patent disclosure, namely, that it is possible to throttle in the Lyndon patent disclosure all of the water passing through the wheel to impel it, whereas in the Lamb patent disclosure it is only possible to throttle one-fifth of the water passing to the wheel to impel it, plus the pro-

vision of one brake nozzle for applying retarding water against the impelling action of the water also applied through four nozzles? Is that correct?

A. That is correct.

Q. 139. Now, further, in the Lamb patent disclosure you don't find any by-pass, do you, which discharges water to the tail-race or from the penstock independently of the wheel, do you?

A. Not independently of water that has not struck the wheel.

Q. 140. All the water passing at any time through any of the water-supply passages or conduits or nozzles in the Lamb patent disclosure must necessarily impinge upon the wheel, must it not?

A. Yes, sir, on the assumption that it leaves the nozzle with sufficient force to reach the wheel, which practically always would be the case.

Q. 141. But there would be an extreme variation between the wheel-retarding action permitted in the use of the Lamb patent disclosure and wheel-retarding action permitted in the use of the Lyndon patent disclosure?

A. It is not correct as it appears to me because in the Lyndon patent the number of nozzles used there to drive or retard the wheel is not limited, and in this patent it could be provided with an equal number of retarding nozzles and driving nozzles, and, further, because of the fact that in order to regulate for speed only and where the main gate in the penstock, not shown in the patent, is providing water suitable to maintain a given speed for a given load, then ordinary variation in the

speed may be taken care of by the supply or withdrawal of comparatively small quantities of water to the wheel. That is to say, small quantities in proportion to the whole quantity being supplied. Or, in other words, if a wheel constructed similar to that set forth in the Lamb patent were driving a certain load at a certain speed, and the load varied sufficiently to make the speed vary a sensible percentage of the normal speed, then the quantity of water required to be added to the supply to the wheel or deducted from the supply to the wheel to bring the speed again to normal condition would be only a small proportion of the total quantity of water used on the wheel for producing power alone, without any reference to regulation. Hence, the construction in the Lamb patent, as I have shown, is competent to regulate speed although loads may vary.

Q. 142. You don't find anything in the disclosures of the Lamb patent which indicates that Lamb comprehended that there might be one driving nozzle and one brake nozzle, do you?

A. I do not remember anything occurring in the text to that effect at this moment. It has been over a week since I read the text and I do not quite remember as to that.

Q. 143. Suppose he provided one driving nozzle and one brake nozzle. When the driving nozzle was wide open the brake nozzle would be entirely closed, would it not?

A. Yes.

Q. 144. And when the driving nozzle was half way open and the brake nozzle was half way open, what would be the effect upon the wheel?

A. The wheel would probably revolve in the direction of the driving nozzle because of the fact ~~that~~^{of} the form of the buckets being better adapted to receive the energy of the water from the driving nozzle than the energy from the retarding nozzle. But that point, as I remember, is set out in the specifications of the Lamb patent wherein he states, on line 64 of page 1, "The proportion of driving nozzles to the brake nozzle may be varied to suit conditions. As at present shown, I have illustrated my invention provided with five driving nozzles and one brake nozzle which will provide for a variation of nearly 50% of the load, and that is more than usually required." That would indicate that he had full knowledge of the advisability of varying the number of either driving or retarding nozzles according to the conditions or results that he desired to attain in any particular installation.

Q. 145. All right. Now, suppose there were one driving nozzle and one brake nozzle in a construction following the Lamb patent disclosures, and they were relatively open so that the proper flow of water took place through both to hold the wheel from revolution by opposite stresses on the wheel. There would be a waste flow of water through the tail-race, would there not?

A. So far as giving energy to the wheel under the specific condition named, all the water would be wasted through the tail-race.

Q. 146. And when the gates of the Lyndon patent disclosure are closed, no waste water is passing to the tail-race, is there?

A. All of it is going to the tail-race when the water-gates are closed.

Q. 147. I mean no waste water is passing to the tail-race by the way of the wheel, is there?

A. Not by way of the wheel, but by way of the by-pass.

Q. 148. Is there any means shown in the Lamb patent disclosure for stopping the wheel other than by the application of these opposite jets of water in balanced relation to the wheel?

A. There are no means shown on the drawing other than that, and my interpretation of these drawings would indicate that the apparatus therein shown was never intended to stop the wheel at all and is not practical to use for that purpose, and not designed for that purpose. To stop the wheel as drawn in the Lamb patent, it is necessary to cut off the supply of water in the main penstock.

Q. 149. Then we are getting just where I expected. The Lamb patent device necessarily contemplates the installation of a water-gate in the penstock in addition to the nozzle 7, does it not?

A. As far as the drawing in the case shows it is necessary to have the gate in the penstock to close off or admit water to the water-wheel.

Q. 150. And no such gate is shown in the Lamb disclosure, is there?

A. No, sir. The installation of such a gate is common in all installations, so far as my experience goes.

Q. 151. And there is no suggestion in the Lamb patent disclosure providing such a gate and hooking it up with the governor control disclosed in the Lamb patent, is there?

A. No, sir. The Lamb patent simply handles the water to regulate the speed and handles it in such a way as not to change the pressure of the water in the penstock. That is all he was endeavoring to accomplish.

Q. 152. Now, you say that when the Lyndon patent gate or gates is or are closed, all the water will be discharged from the penstock through the by-pass. How do you account for that being possible when the Lyndon patent specifically discloses that consequent upon any governing action the by-pass will slowly return to a given position?

A. He discusses, if I remember the text of his patent correctly, that his by-pass returns to a position of half-open when the wheel is operating, as I remember it, under normal conditions. Now then, a wheel whose water-gates are closed, is not operating in a normal condition.

Q. 153. I am speaking of periods of non-operation. Let it be assumed that the by-pass in the Lyndon patent is normally closed. Then with the gates closed, there would be no water passing from the penstock through the by-pass or to the wheel either, would there?

A. If the water-wheel gates shown in the Lyndon patent are closed and if the by-pass were closed, no water would pass from the penstock except ordinary leakage.

Q. 154. And in the Lamb patent disclosure there is no means shown for terminating the flow of water to the wheel, is there?

A. Not in the drawing of the Lamb patent.

Q. 155. And you don't find any such suggestion in the specification?

A. No; I cannot remember any such suggestion. It is a matter of common practice to have a valve in the pipe-line.

Q. 156. And that valve would in no way be controlled by the Lamb device?

A. Governing mechanism; no, sir.

Q. 157. Do you consider the nozzle gate in the respect that it passes water to the wheel for direct action upon the wheel a working nozzle?

A. It is a working nozzle in so far as it works to retard the revolution of the wheel, but it is not a nozzle placed there for the purpose of providing what may be called useful work in the wheel. It is for retarding or offsetting or nullifying the useful work done on the wheel by nozzles 7 and 6, as shown in Figure 1 of the Lamb patent. The work done by nozzle 8 is useful only as a retardant, for which purpose it is installed.

Q. 158. Do you consider that that nozzle 8 is entitled to the description of a by-pass with respect to the working zone of the wheel?

A. Incidentally to its construction it is a by-pass. It is inserted in the construction for the purpose of supplying water to retard the wheel, water that has already been cut off from supplying the wheel with useful energy, and in that respect it maintains a uniform flow in the penstock and acts, so far as the wheel itself is concerned, much the same as if the greater quantity of water had been cut off from energizing the wheel, as by nozzle 7, and the less quantity of water allowed to escape and by-pass, as at nozzle 8. The effect in both cases would be

identically the same on the useful work given out by the wheel 2.

Q. 159. But the nozzle 8 does not pass any water by the wheel without striking the wheel, I believe you have said?

A. The drawings would indicate that no water passed nozzle 8 with sufficient velocity that does not strike the wheel 2.

Q. 160. Therefore, in that sense, that is, the sense of passing water by the wheel, the nozzle 8 is not a by-pass, is it?

A. It is not a by-pass in the ordinary sense, but its action is identically the same upon the wheel as would be caused by a by-pass operated in the same manner as I have just described in my answer to the previous question.

Q. 161. But you will admit that it does not pass by the wheel without acting directly upon the wheel?

A. Certainly. That part is correct.

Q. 162. And, in that respect, namely, that it applies the energy of water to the wheel for the production of a certain physical result, it is a working nozzle, is it not?

A. As I answered to a previous question, the water discharged against the wheel by nozzle 8 does work contrariwise or in opposition to the work done by the water discharged upon the wheel by nozzle 7, as being typical of the other nozzles 6.

Q. 163. Now, in the Lyndon patent device, any water flowing through the by-pass 47 imparts no energy whatsoever for the production of any effect whatsoever to the wheel? Is that not correct?

A. That is correct. The water passing the by-pass in the Lyndon patent does not by coming in contact with the wheel have any effect thereon whatever.

Q. 164. In other words, it does no work at all?

A. It does no work.

Q. 165. I call your attention to the group of parts in the lower portion of Figure 1 of the Lyndon patent controlling the action of by-pass nozzle 48, and which the specifications discloses causes the slow return of the by-pass valve to normal position after such valve has operated conjointly with the water-gate. Do you find in the Lamb patent disclosure any analagous means or any means serving to operate the valve 9 in the nozzle 8 independently of the valve 9 in the nozzle 7 and after conjoint action of these valves has taken place?

A. I do not.

Q. 166. In other words, there is always a definite step relation, is there not, between any action between valve 9 in the nozzle 7 and any action of the valve 9 in the nozzle 8?

A. I understand that to be true. I believe it is true in the Lamb patent as such relations would fulfill the conditions or requirements that he was endeavoring to accomplish as disclosed by his patent in question.

Q. 167. As a matter of fact, the Lamb patent device is essentially a wheel-brake device, is it not?

A. No, sir; it is a speed-governing device.

Q. 168. Well, in that respect, it is a wheel-brake device? In other words, water is applied to the wheel to brake its action by opposing the direct impelling action of the water applied to the wheel? Is that not correct?

A. That is not quite correct, because while he applies water to have a braking action on the wheel, he cuts off a portion of the impelling water at the same time.

Q. 169. And that accentuates the braking action, does it not?

A. Yes, sir; it accentuates the braking action and also reduces the impulsive action or the net effect of the impulsive action of the driving water.

Q. 170. And in the Lyndon patent disclosure do you find any conduit and valve specified through and by which the admission of water to the wheel is permitted and which in any sense can have a braking action or retarding action upon the rotation of the wheel?

A. I do not.

Q. 171. Nor is there present in the Lamb patent any by-pass in a water-supply pipe or conduit through which water may flow with or without regulation, independently of the circuit of water to the wheel? That is correct, is it not?

A. Yes; that is correct as I understand the question.

Q. 172. And there is no disclosure in the Lamb patent, is there, that this device will provide for a variation of fifty per cent of the load or more?

A. The particular drawing shown in the Lamb patent would probably provide for something over 35% of the load, and it would appear that it is not impossible to so arrange the nozzles as to provide for any proportion of it they saw fit.

Q. 173. How do you calculate that 35% with four totally unobstructed nozzles being resented and only two nozzles capable of relief regulation?

A. I will explain that. Assume a condition of operation where the four nozzles marked 6 are wide open, and also the nozzle marked 7 is wide open, and the nozzle marked 8 entirely closed. That must necessarily be the condition of the wheel where it would give 100% of its power. If I now close nozzle 7 entirely, we will assume we cut off 20% of its power; and if I have opened nozzle 8 to its full capacity I have applied to the wheel in an opposite direction to one of the nozzles 6 an equal or larger quantity of water. But we will say, for example, an equal quantity of water to that supplied by nozzle 6 which, if it were applied to a bucket of equally good form, would take off another 20% of the power of the nozzle heretofore referred to. But I do not believe in practice it would be quite true, so I assume for the sake of making an answer that the nozzle 8 would only cut off 15%, thus deducting 35% in all from the 100% previously mentioned.

Q. 174. Now, referring to the Lyndon patent, let us assume that governing action causes a 90% closing of the gate and a 90% opening of the by-pass valve, as the first case; and, as a second case, that governing action causes a 90% opening of the gate-valve and a 90% closing of the by-pass. What in such an installation would you calculate to be the load fluctuation so provided for?

A. Practically 90% of the load.

Q. 175. When valve 9 of nozzle 8 in the Lamb patent is opened or partially opened, will there not be a back-thrust of water upon the column in the penstock?

A. There will not, because there can be no time in the operation of the wheel as here shown when the pres-

sure behind the buckets of the water-wheel would equal that pressure in front of it. Consequently, the pressure in nozzle 8 must at all times be less than the pressure in the penstock, and there could be no reverse action or kick-back due to the revolution of the wheel in opposition to the direction of the flow in nozzle 8.

Q. 176. I note that a certain statement was made in page 2 of the Lamb patent terminating in lines 36 to 38, as follows: "This prevents the backward thrust of the water causing too much friction on the moving parts." Does not that imply that there will be some back-flash or back-kick through these nozzles?

A. Not at all. I will endeavor to make that thrust question clear. Owing to there being any pressure whatever or due to any pressure whatever in nozzle 8, there will be a thrust acting to force the valve 9 in the direction of its stem 12, which thrust-action will be in proportion to the cross-sectional area of the stem 12. The same is true of the valve 9 back of nozzle 7. The pressure within the valve 9 and in nozzle 7 tends to thrust the valve 9 in the direction of its stem 12 by a force proportional to the cross-sectional area of such stem. That is the thrust first referred to and taken care of as indicated. The reason that prevents the backward thrust causing too much friction is that the load of the back-thrust is transferred by stem 12 to a center about which the stem is free to revolve and is not distributed over the large area forming the end of the main body of valves 9, the result being that the force of friction is constrained to work on a much less radius and, consequently, not offering so much resistance to the movement of the valve.

Q. 177. However, there is a back-kick in any stream of projected water, is there not?

A. When any stream of water is projected from a nozzle there is a reaction. That is to say, there must be some force to hold the nozzle against that reaction which is caused by the column of water coming in contact with the atmosphere.

Q. 178. Now, do you find disclosed in the Lamb patent at any point any such means as is disclosed in the Lyndon patent for preventing the over-running of the governor, as, for instance, the parts including the clutch-members 22 and 23 and the electro-magnet 32 for energizing the same, such clutch-members tending to restore the core 34 of the solenoid 33 to normal position?

A. I do not; and in the case of a wheel governed as is indicated in the Lamb patent or in a wheel where the speed regulation is effected without change of pressure in the penstock, said over-running of the governor is infinitesimal in proportion to what the over-run would be were there no provision made for maintaining uniform pressure in the penstock.

Q. 179. Let us assume that there are more extreme fluctuations of pressure in the penstock. Does not the danger of over-running or governor-hunting, as I believe you have referred to it, arise?

A. Extreme variations of pressure in the penstock caused by quick opening or closing of the gates to a water-wheel cause great difficulty in the governing mechanism finding proper location. But the fault is not in the governing mechanism itself; the primary fault is the fluctuation in pressure. The governing mechanism by its

own sensitive actions being responsive to changes of pressure, causes the hunting or overrunning where these fluctuations are excessive.

Q. 180. And you do not find anything in the Lamb patent to correct any such overrunning or hunting, do you?

A. I do to this extent; that the Lamb patent provides means for discharging such water from the penstock by one valve as it cuts off from the water-wheel by another valve. This combination ^{of action} acts to maintain uniform pressure in the penstock.

Q. 181. Supposing the generator operated by the wheel of the Lamb patent were running at full load, and the main fuse in the line from the generator should blow. Wouldn't this cause such a violent and immediate fluctuation in the load on the wheel that its overrunning tendency would be present?

A. Such a case as that indicated by a generator being operated at full load with a wheel constructed as set forth in the Lamb patent, and the load being immediately released, the whole load being immediately taken off the water-wheel, the water-wheel would in that case far overrun its normally intended speed. But the Lamb patent further provides, although not shown in the drawing, that the number of nozzles acting to retard the revolution of the wheels may be any desired number,—the same as the number of nozzles supplying water to the wheel may be of any desired number. Consequently, it is fair to assume that if he were to operate an electric generator with a wheel designed under his patents, that he would provide a sufficient number of retarding nozzles

to take care of the full load of work done, in which case the action as indicated by his drawings would be much as follows: that immediately upon the release of the load on the water-wheel there would be an increase of speed to operate the speed-governor shown, I believe at 30 in Figure 4 of the Lamb patent, which would immediately act to close the nozzles supplying energizing water, and to open the nozzles supplying the retarding water to hold the revolutions of the wheel within reasonable control.

Q. 182. Supposing half ^{of} the load were taken off of the wheel by the blowing of fuses in the power-line supplied by the wheel controlling the supply of energy to half of the power-consuming apparatus. Would there not be such fluctuation in the load of the wheel thus caused that there would be a governor-hunting action prior to the restoration of exactly the proper ratio between load and water-supply?

A. So long as the arrangement of nozzles and the number of nozzles shown in the Lamb patent was so arranged and operated in such manner as to maintain uniform pressure in the penstock, as has been heretofore testified to, that is to say, that when the gates closing off the energizing water acted coincidentally with the gates opening to discharge water from the penstock, the whole maintaining a uniform pressure in the penstock regardless of the position of the water-wheel gate, then any sudden change of load on the water-wheels would only produce a momentary change of speed in the water-wheels and act on the governing mechanism to control the gates mentioned, and this momentary action is mo-

mentary because of the fact that the pressure in the penstock remains uniform regardless of the position of the gate, and operates to prevent hunting of the governor.

Q. 183. And you think the wheel would go to its proper new speed in the first phase of governor action, do you?

A. By "first phase" you mean the first motion giving more speed or less speed?

Q. 184. Yes.

A. I do not. There is nothing shown in any of these patents in question, either the Lamb or the Lyndon patent, that would indicate that the governor would do that in the first phase of its action under any circumstances.

Q. 185. But a device to prevent or to, in the main, eliminate such overrunning action, is a desirable and even necessary element in a proper water-wheel governor, is it not, where wide fluctuations of load take place?

A. Where wide fluctuations of load take place close governing is necessary. Whether that shall be effected by having an overrunning-preventing device or not is immaterial, because the same results can be effected by governors acting without having any particular and special over-running devices by reason of their other forms of construction, and by reason of the fact that they provide uniform pressure in the penstock.

Q. 186. Isn't such an over-running-prevention means or anti-governor hunting means used within your knowledge of the art in installations where these violent load fluctuations have to be met with?

A. I know of installations, where no so-called over-running device is in use, that gives practically perfect

regulation. The installation at Grass Valley that was introduced here this morning gave regulation satisfactory to all concerned, and it has no special over-running device specially constructed. The installation at Bakersfield, California, has no specially constructed so-called over-running device. That is the best regulation of any water-wheel made up to its time.

Q. 187. That plant that you have testified to, namely, the so-identified 1897 Power Development Company plant near Bakersfield, is not now in operation in the form in which it was installed, is it?

A. I have no recent knowledge of what is installed in the power plant at Bakersfield. The plant, as I left it there, has been in operation for some time and, as I believe, was maintained in operation for some time thereafter. The wheels that were there at the time I left it I know were ~~were~~ taken out and others tried on the same shafts. They were endeavoring at that time to find some water-wheels to put on those shafts which would give a higher efficiency than those they had on them, and different water-wheel makers were endeavoring to provide such wheels.

Q. 188. You know, do you not, of devices being used in connection with governors of hydro-electric plants to prevent the over-running of such governors?

A. Yes, sir.

Q. 189. Can you state the name of any such device for preventing over-running, as it is known in the trade?

A. No, sir; I cannot. The Lombard governor or the governor that I recognize as being of the Lombard type provides a mechanism that, for any position taken sud-

denly by the speed controlling mechanism, a certain balance valve may be brought with reasonable speed to a position from which it had just been moved by the action of the speed-governing device above mentioned.

Q. 190. What does that valve do in such construction?

A. That balance valve supplied water or oil under pressure to operate the piston in a hydraulic cylinder.

Q. 191. And what did that piston do?

A. By means of proper connections it operated the gates of the water-wheel.

Q. 192. And the by-pass in the penstock also?

A. It could do so and in some cases does do so, but I am speaking now strictly of the Lombard governor. It simply gives motion to a piston which you can connect up any way you want to.

Q. 193. Away back in 1897 did you know such a device as the Lombard governor device?

A. No, sir.

Q. 194. Did you ever see such an one?

A. I have seen them in power houses, but never paid particular attention.

Q. 195. Would you recognize one by its general appearance if you saw it?

A. I think so. I think I could tell some of the salient parts of it if I saw it. I have seen pictures of it.

Q. 196. Please look upon the table and see if you can see among the exhibits present anything which you would call such a Lombard governor device or part thereof.

Mr. Westall: Objected to as not proper cross-examination.

A. I would say from my casual inspection of these parts on the table that they were taken from a Lombard governor. I do not know it for sure, but they look like pieces that I have seen in illustrations of a Lombard governor.

Q. 197. By Mr. Blakeslee: Now, in a water-wheel installation in which all of the water passing through the wheel is controlled by a gate or gates under the final control of a governor, does not a water-ram always occur in the penstock under violent fluctuation or material fluctuation of speed of the wheel and synchronous governing of the gate?

A. Not if uniform pressure is maintained at all times in the penstock.

Q. 198. And how would you maintain such uniform pressure in the penstock?

A. By maintaining a uniform flow.

Q. 199. And how would you do that?

A. By allowing as much water to escape from the penstock at any instant as I cut off from the wheels at any instant.

Q. 200. And another way to do that would be through a by-pass, would it not?

A. It would.

Q. 201. Now, coming back again to the Lamb patent, inasmuch as all the water flowing through the penstock must go to the wheel, even under governing actions, you have not the same conditions present, have you, as you would have in an installation in which there were a gate or gates controlling part of the flow from the penstock to the wheel and in which you also have a by-pass like-

wise permitting the escape of part of the water from the penstock independently of the wheel? Is that ^{not} correct?

A. It is not.

Q. 202. Please state why not.

A. It is not, because in a completely designed wheel under the general scheme set forth in the Lamb patent, we can assume that there would be just as many nozzles, for the sake of example, to supply retarding water, having just the same capacity as there are nozzles to supply energizing water. Then if we so connect those that the exact quantity of water cut off from energizing nozzles be allowed to flow through the retarding nozzles, and vice versa, we maintain under those conditions a continuous and uniform flow in the penstock and also uniform pressure therein, regardless of the final effective energy given off by the wheel.

Q. 203. Well, that is just the understanding that I have arrived at from your testimony, and I am asking you whether that is not a condition which is very different from the other condition assumed, namely, when you have a gate which controls the passage of part of the water, namely, that which goes to the wheel, and a by-pass which controls part of the water, namely, that which does not go to the wheel. Now, there is a very different condition existing in these two cases, is there not, with respect to water ram in the penstock?

A. There can be no water-ram in the penstock where the conditions of flow do not change.

Q. 204. Well, then assume the elimination of the by-pass. How about the water-ram then?

A. Assuming a penstock operating without a by-pass

and that water-wheel gates were opened or closed suddenly, then water-ram might occur in the penstock and probably would.

Q. 205. Whereas, in the Lamb device if there be a constant ratio inversely between the nozzle areas, that is, the areas of the nozzles supplying water to impel the wheel directly and the nozzles applying water to retard the wheel, such water-ram, I take it from your testimony, would not occur? Is that correct?

A. Well, water-ram would not occur in any penstock regardless of the conditions or construction of water-gates as long as no change of flow takes place in the penstock. And any conditions that you are ^{to}amid^{to} assume, as long as there is no change of flow and no force acting to change the flow or to change the vedocity of flow in the penstock,—there can be no water-ram in the penstock.

Q. 206. Then under the conditions assumed in my last question there would not be a change of flow in the penstock? (Question No. 205 is read.)

A. That is not correct, but I think I can indicate more clearly why not. The question refers to areas of nozzles discharging water inversely upon the wheel and naturally one may assume that the pressures in those areas would be equal in both cases, and their effect upon the wheel equal, which is not to my understanding true. But if the question meant to infer that the valve opening supplying energizing water was increased in its amount of opening by just the same amount or area that the valve supplying retarding water was closed, then I could say there would be no ram action, because under those conditions

there would be no change of velocity of flow of water in the penstock.

Q. 207. Then following the Lamb patent disclosure and making the distinction you have just made, it is quite likely that there would be some ram action in the penstock?

A. No, sir; because as I told you as much water as I closed off by one valve I allow to escape through another, and consequently my flow must remain constant.

Q. 208. Whereas, in the use of a gate such as is provided by Lyndon, sudden closing of the gate would produce such a water-ram in the penstock were it not for a by-pass, would it not?

A. Yes.

Q. 209. And that is a very definite distinction between the disclosures of the Lamb and Lyndon patents, is it not?

A. No, sir, because you have not included in the distinction in the statement concerning the Lyndon patent—you have only asked it in reference to closing the water-wheel gates if there were no by-pass. Now, if there is no by-pass provided in the Lyndon patent and you were to suddenly close the water-wheel gate, you would get a water-ram. And that corresponds to my understanding of your question regarding the Lyndon patent. Now then, applying the same question in my mind to the Lamb patent, if you fail to operate the so-called retarding valves, one of which is indicated at 8 in Figure 1 of the Lamb drawing, and only operate valves controlling nozzles similar to 7 in the same Figure, that would also pro-

duce under the same conditions of sudden closing of the valves ram in the penstock.

Q. 210. And in the Lyndon device the opening of the by-pass allows an escape of water independently of the wheel, whereas the opening of this brake-action nozzle in the Lamb device passes water to the wheel, does it not?

A. While it passes water to the wheel, it allows the proper escape of water and the required escape of water just the same if it discharged water independent of the wheel; but the object of the ^{Lamb} ~~ram~~ in providing this escape of water to the wheel was simply to produce a quicker action on the wheel and to regulate its motion.

Q. 211. In other words, a distinct application of the force of the water to the wheel with the consequent physical effect upon the wheel?

A. He makes a double use of the water by means of nozzle 8 or any number of such nozzles on the wheel. The first use of it is that it allows of a uniform flow of water in the penstock, and its additional use is to use the water passing through these nozzles 8 as a retardant to the revolution of the water-wheel.

Q. 212. Now, in view of your testimony that devices such as the Lombard governor have been perfected for preventing overrunning of governors, do you consider that the device of the Lamb patent meets the requirements of the present day practice as to governing in connection with hydro-electric plants?

A. I believe that where the saving of water used in a wheel installation was not a question, that is to say, where the quantity of water passed for wheel operation was unimportant, that using the Lamb patent as a basis

of design and following out the constructions there indicated, that a properly operating water-wheel to correspond to the average conditions of electric power plants could be constructed.

Q. 213. Did you ever see or hear of a hydro-electric water-wheel governor constructed as you understand the disclosure of the Lamb patent?

A. Not precisely like the Lamb patent.

Q. 214. Did you ever hear or know of such a governor being constructed in which part of the water struck the wheel in one direction and part in another to effect governing action?

A. I never have seen such a device except as disclosed in the Lamb patent.

Q. 215. Now, referring to this so-called North Star installation, as we will call it, which you have stated was installed about 1896 at Grass Valley, is that the same one that was later modified to constitute the so-called 1898 Grass Valley or North Star installation?

A. No, I think not, if I understand what you are getting at. There was an installation put in at Grass Valley in 1896. I am not sure about this. And then later an additional installation was put in and that was about the 1898 installation.

Q. 216. That 1896 installation had no by-pass, did it, to the penstock?

A. No, sir.

Q. 217. And it had no means as we have discussed it for preventing over-running of the governor independent of such direct governing action as there was?

A. As I recall it,—if I had time I could look it up in

my notebooks—as I recall the installation at Grass Valley now, the governing device applied to the wheels was not satisfactory. The one I now refer to is the original installation at Grass Valley and the one which was in use when there was no relief on the penstock, and the one provided, I think, by the people who provided the buckets on the wheel.

Q. 218. How long was that operated, if you know?

A. I believe I changed the governing mechanism on that installation some time in 1898. That is, I believe the designs I made were introduced there. I do not remember whether I personally was present when they put on the original installation there or not, but I designed the scheme and I presume I was present, because I was there at the plant considerable.

Q. 219. What was done with the power generated with that plant?

A. The original plant, the power developed by the wheel was used to run an air compressor.

Q. 220. What was done with the power generated by the so-called 1898 North Star plant?

A. The main installation there was always an air-compressor.

Q. 221. In a plant of that sort big speed variations were permissible, were they not?

A. In a sense, as compared to, for instance, an electric light plant, they were permissible. But as a matter of fact, in that plant the regulation was such that the speed was uniform and was, so far as I know, perfectly satisfactory in respect to its uniformity. There was no means that we had at that time in that plant for deter-

mining that it was not uniform. It was exceedingly satisfactory.

Q. 222. If the speed had not been uniform there would have been no material effect upon the action of the compressor, would there?

A. Not at all.

Q. 223. And that differentiates materially from the conditions which are proper in operating an electric-energy generating plant?

A. Not necessarily, because we had our nozzle and governor operating an electric generator there, and it also could operate the air-compressor, and there was no trouble about the operating of that electric generator by exactly the same governing devices that were operating the air compressors.

Q. 224. But what I mean is constant speed is far more necessary in operating an electrical generator than in operating a compressor?

A. There is no doubt about that. But the device installed at Grass Valley did operate an electric generator in a satisfactory manner.

Q. 225. But it did not have any of the features we are discussing here, such as the by-pass and means for returning such by-pass to normal position, and means for preventing the governor overrunning, did it?

A. It did not require those contraptions because it had the best devices that we could supply for providing even pressure in the penstock.

Q. 226. And that device, briefly stating again, was what?

A. It was a combination of an air-chamber with an automatic opening valve.

Q. 227. And where was that placed?

A. On the penstock within the power house.

Q. 228. And it allowed the escape of water from the penstock?

A. Under certain conditions.

Q. 229. And you say it was automatic and was not connected with any governing device?

A. It was not, for the reasons that I have stated heretofore in my testimony, that it had to operate independently of the wheels within this power house, because the pressure in the penstock was affected by water wheels at a distance from this power plant, and beyond the control of this power plant, and, consequently, in order to attempt to maintain any uniformity of pressure in the penstock at this power plant it was necessary to have some device which received its whole and sole operating energy from the penstock itself.

Q. 230. Then this relief device simply acted after a sufficient pressure had been caused or produced in the penstock? Is that correct?

A. It acted for every increase in pressure in the penstock.

Q. 231. . Of a certain definite amount?

A. It took a little—a pound or two—to operate it. But just as soon as that increase occurred it was impossible for us at that time to—or, rather, we did not at that time come across any better device for maintaining a uniform pressure than the one that was built. It was a pioneer attempt in trying to overcome defects

known to exist under such conditions, and, so far as the speaker knows, was entirely pioneer work, and it worked well; so well that the Blue Lakes Water Company afterwards introduced one on their penstock near the power house where they had no other conditions to contend with than simply the operation of their own wheels.

Q. 232. And this device was entirely automatic in its action I understand?

A. Yes, sir; that was one of its specially good features when you consider the conditions under which it was proposed to have it apply.

Q. 233. Do you know of any such relief devices being used today in connection with the penstock of hydro-electric plants?

A. I don't know of any inserted in any modern plant. I have not been in touch with them, anyway. I do not know whether they have done it or not.

Q. 234. In other words, that line of work was abandoned in standard practice and in substitution therefor these other various means, such as by-passes controlled by governors, were taken up subsequent to 1896 or 1898? Is that not correct?

A. Well, sometime about 1895 or 1896 the question of by-passing the water was being worked on. But, at the same time, that question, as you state it, is rather too broad for full acceptance, for this reason: it is not good business to operate a by-pass mechanism where it is essential to save water; and in many of the plants in California it is important that all the water be passed at any rate through the plant itself or around some overflow provided for the water, and, consequently, there are

not many installations where the saving of water at the wheel is of vital importance. But where the water cost heavily for applying to a wheel for generating power, it then, naturally, and as a purely business proposition, it becomes essential to try and govern that wheel with the use of just as little water as possible, and that was the case at Grass Valley installation, for instance, and it might be, so far as my knowledge goes, the case with other installations with which I am not now acquainted in the state. But there is no question but that in most of the installations in the state it is essential that the full quantity of water be passed because it is used below, and, consequently, by-passes came into use readily.

Q. 235. In other words, by-passes have been found to have incidental advantages, such as you have mentioned for by-passing the water around the wheel, such as for irrigation and like uses? Is that not correct?

A. Only incidentally. You don't quite get my idea. My idea is that, given a certain supply of water at the head of the penstock which it is necessary to deliver at the lower end of the tail-race, then it is immaterial, so far as rights below the tail-race are concerned, how that water reaches them, and it may be immaterial to the power plant located between the entrance to the penstock and the outlet of the tail-race as to how he handles that water between those two points. And if he can handle it in such a way by the use of by-passes as to regulate his wheels and get his power, well and good. But if he prefers to let some of this water provided at the head of the penstock to flow through any other channels to the foot of the tail-race, it is just as well, too.

Q. 236. What I mean is, that water passing the by-pass is conveniently utilized in many ways, is it not, particularly in countries where irrigation is carried on like it is in California?

A. It might or might not be. It is not material to the power plant after it goes away from it.

Q. 237. I mean it is material to the question of conservation in the use of water and using it for all such purposes as may be present in a locality?

A. Not at all in the question that I have just answered, for the reason that as I just answered all the water taken out or supplied to the upper end of the penstock must be delivered to the lower end of the tail-race in such cases, and the power plant has no real effect on the prior or later use of the water.

Q. 238. When water-rights below the point of installation are to be considered, the saving of water is a material feature, is it not?

A. No, sir; that is the time when the power plants below have no control. You save your water when the people below you cannot demand it of you. That is when you save it.

Q. 239. I am assuming possibly the use of water at several stages and the water rights attaching to those stages. It then becomes important that the water be so conserved?

A. You say you can assume all manner of conditions surrounding such a power house. One power house may have to conserve the water for certain purposes and another may have to let it go by so another man can use it, but the whole thing revolves around the point that

I have just mentioned. It is immaterial to the power plant man what was done with the water before it enters his penstock or what was done with it after it left his tail-race.

Q. 240. Now, another type of control of water-wheel nozzle has come into considerable use, known as the deflecting nozzle, has it not?

A. No, sir; I think that is going out of use.

Q. 241. What do you think is superseding it?

A. Various other means. I will say that I don't deny but what your assertion may be true, but to my knowledge I have not seen any operated in recent years. But various other devices for producing the same result, which result was a constant flow of water regardless of the quantity used on the wheel.

Q. 242. Such, for instance, as the combined governor of water-gate and by-pass?

A. The deflecting nozzle actually performed that function for the water-gate and by-pass in really a better manner than it had been done in many respects by some forms of water-gate and by-pass.

Q. 243. The deflecting nozzle cannot be used with a turbine wheel, can it?

A. No. That is why it was that the Lombard governor, to which you called my attention here a few moments ago, was the result of efforts to govern in its original forms, and it was intended for the governing of turbine water-wheels. Its application to tangential wheels has been of a more recent date. But, as I said before, I have not had under my own control a Lombard governor where I had an opportunity to monkey with it.

Q. 244. But you have seen them in operation?

A. Yes; but not where I could get my fingers on them and do as I had a mind to. I think, so far as my knowledge goes, they are considered a satisfactory governor.

Q. 245. And I would understand from you then that other types of water-wheel controls, such as gates and by-passes, have laterally come into greater use than that of the deflecting nozzle referred to?

A. I don't know all the recent installations put in water-wheel plants, and I cannot answer that question correctly, I presume.

Q. 246. Well, from your own observation, which have you seen more frequently?

A. From my own observation I have not seen a water-wheel controlled only by a deflecting nozzle in twenty years. I don't think I have seen one controlled solely by deflecting nozzles in twenty years.

Q. 247. And in the use of deflecting nozzles any water not striking the buckets of the wheels is entirely wasted, as far as the operation of the plant is concerned, is it not?

A. Oh, sure. It passes below into the tail-race. There is just the same waste exactly as if it went through a by-pass valve.

Q. 248. Now, assuming that in the use of apparatus generally like that of the Lyndon patent, the by-pass were normally closed, that is, returned slowly to normal closed position after the governing action, there would be no waste of water to the by-pass other than during the period of governing action, would there?

A. As I understand your question, there would not be any waste except during governing action.

Q. 249. And that would establish the marked advantage in saving of water over the use of a deflecting nozzle, would it not?

A. Not necessarily. It would in case the man using a deflecting nozzle had to pay so much an inch for his water, but that does not apply except as I before stated, only in certain cases. There are cases where the use of a deflecting nozzle for handling the water-wheel is prohibitive on account of the cost of the water.

Q. 250. I am assuming that the water has a money value per miner's inch. That saving would be material, wouldn't it?

A. Wherever the use of the water costs so much per miner's inch, passing out of the tail-race of the water-wheel installation, then that device used in the installation which causes the greatest quantity of water to do useful work upon a water-wheel has the advantage.

Q. 251. And that conservation of valuable water would occur in the use of the Lyndon patent disclosure with the by-pass normally set at closed position as just instanced?

A. Assuming as you have instanced, that the by-pass of the Lyndon patent is closed at all times when the speed of the wheel or its load does not need regulation, then such a condition contributes to the economy in the use of the water.

Q. 252. And there would be a proportionate saving of water, would there not, with the by-pass valve of the

Lyndon apparatus at any point normally between full open position and full closed position?

A. I say no to that question, because I believe that the measure of water discharged by the by-pass must be proportionate to the variation in speed or load which affected the wheel, and caused the by-pass to come into operation at all, and change its position at all from full closed as stated.

Q. 253. I am assuming now various positions of the by-pass which are normal positions.

A. You did not state anything to me but full closed. Now, if you are going to have a half a dozen other normal positions, you must state them.

Q. 254. I am asking you if there would not be a saving related to normal position of the by-pass, with the by-pass normally standing at the several positions between fully closed and fully open?

A. Without further study I would think there would be a partial saving just the same as there would be a partial saving by similar operation of the nozzles in the Lamb patent.

Q. 255. In the Lamb patent device there is no normal position of the valve 9 of the brake-nozzle 8, is there?

A. I could assume any position of that valve 9 of nozzle 8 to be normal just as you could assume any position of the by-pass 48 in the Lyndon patent, and in making my reply I would assume such a consideration to be the case.

Q. 256. But that valve 9 of the brake-nozzle 8 of the Lamb patent does not occupy that normal position

or return to it independently of the valve 9 of the power-nozzle 7, does it?

A. It does not.

April 9, 1914. A. M.

CROSS-EXAMINATION (resumed).

By Mr. Glaheslee
QJ 257.

Referring again briefly to Defendant's Exhibit Lamb Patent, please state to me what is your understanding of the operation under control of the governor of the part suggested by the dotted lines 30 in Figure 4, of the part 24 which I believe you have referred to as a floating lever.

A. Reading from the drawing shown at Figure 4 of the Lamb patent in connection with the parts of the specifications from line 41 on page 2 of the specifications, the dotted lines 30 represent any form of governing device to operate as a governor by the change of speed, which is driven, as indicated by the dotted line, by a belt from the water-wheel shaft 3; the ordinary fly-ball type of governors act to move a rod contained therein vertically, and said rod is represented in the drawing by the rod 25. Rod 25 operates to raise or lower lever 24 which, in turn, by the links 23 is connected to the levers 20, and by suitable connections 21, 22 and 21, operate the valve-stems 12 in such manner that any motion of rod 25 upward or downward will give motion to the valves 9 controlling nozzles 7 and 8 as shown in Figure 1 to cause the supply of or cutting off of the water for driving the water-wheel and the cutting off

or supply of water for retarding the water-wheel, the object being to thereby regulate the speed of the water-wheel.

Q. 258. As the bar or part 24 is only supported by the rod 25, and is pivotally connected with both links 23 and both levers 20, it is possible for one of the valves 9, say in the nozzle 7, to remain stationary while the other valve 9, say in the nozzle 8, moves; is it not?

A. As shown and constructed in the drawing it is possible for one valve to stick and the other valve to do all the moving. But as the specific operation of these levers is no part of the claim, they need not be followed in the construction of the wheel under this patent to operate nozzles to produce the results called for in this patent.

Mr. Blakeslee: We will have to ask that the last sentence of the answer be stricken out as not responsive.

Q. 259. My question, Mr. Cobb, was merely as to the possibility of action of the parts specifically referred to. Now, let it be assumed that one of the valves 9, being jammed or frictionally held, as by its gland 13, or the packing under the same, we will say the valve 9 in the nozzle 7, would it not be possible, referring to the construction shown in the drawings of the Lamb Patent, for the other valve 9, in the nozzle 8, to move?

A. Yes, sir. But I wish to say in connection with that that the construction shown in Figure 4 and just referred to is in no way claimed in, for instance, Claim 1 of the patent. They could use under Claim 1 of the patent any connection they saw fit between governor 30 and valve-stems 12. Without any reference to that

shown, the drawing in evidence shows the theoretical method of operating it. Practically it would act as in my answer as one valve might stick and another might operate.

Q. 260. Of course, Mr. Cobb, the interpretation of this patent is for the court, and what I am aiming to determine is whether or not these results might not occur from the construction shown in the drawings and disclosed in the specifications. As to that, there is the possibility of one of such valves 9 remaining stationary while the other operates, is there not?

A. That is true, if the mechanism were constructed exactly as shown in the drawing.

Mr. Westall: Counsel for the defendant simply suggests that while the interpretation of the patent is for the court, the questions are going to the theory of operations, and the witness has answered qualifying his answers, in order to make his meaning clear. Counsel cannot insist upon having an interpretation, accepting the interpretation of the witness which seems to support his case and rejecting everything that might possibly militate against him.

Mr. Blakeslee: If counsel had followed the question carefully he would necessarily be aware that my questions were directed at the specific construction disclosed in the patent drawings and specification, and this is not the place to argue the matter.

Mr. Westall: Counsel has followed the question very carefully and submits that the answer of the witness is entirely responsive, and those parts objected to were no more an interpretation of the patent than those

parts of the answer not objected to and not moved to be stricken out.

Mr. Blakeslee: Counsel should leave those matters to the court, which we do confidently.

Q. 261. Now, Mr. Cobb, if during an attempted governing action of the device disclosed by the apparatus disclosed by the Lamb patent, the load upon the wheel should be decreased and the valve 9 in the nozzle 7 should become jammed, the valve 9 in the nozzle 8 should open wider, responsive to the governing action, or, vice versa, as to the conditions and operations of the valves, would not the pressure conditions in the penstock, which you have testified to as being approximately balanced or even, become disturbed?

A. Yes, sir.

Q. 262. And under those conditions would not water-ram probably occur?

A. To produce perceptible water-ram considerable change would be required. But, theoretically, ram would occur.

Q. 263. And, whether or not theoretically, it would occur, would it not?

A. It depends on how much you move the valve.

Q. 264. In other words, it would be a question of degree?

A. That is why I used the expression "theoretically."

Q. 265. And in view of the percentage of load variation which it is specified in lines 66 to 70 of page 1 of the Lamb patent, are provided for in the specific provisions for nozzles shown in the drawing of the Lamb patent, this ram might be such a ram as would be ac-

companying at least a 15% load variation, calculated upon your previous testimony, might it not?

A. It might, particularly if the load was very suddenly changed. If the load were changed slowly, that would greatly modify the force or energy developed in the ram-action of the water and might prevent it altogether.

Q. 266. But if the governing action was so responsive as to reasonably soon correct the conditions of change in load, that ram might be expected to occur, might it not?

A. If the governing mechanism moved with desirable rapidity and strictly in accordance with the conditions which would set about such governing, it would probably produce perceptible ram in the penstock.

Q. 267. Taking up the North Star or Grass Valley installation, which you have testified about, coming to the year designated in your testimony as 1898, as I remember it, will you state, please, how far your alterations went with respect to the installation which you have located in the year 1896 at that plant?

A. The nearest that I can remember without looking up specific data with respect to the installation of 1896 and the alterations on the 1896 installations made in 1898, consisted of supplying a new water-wheel governor and the device inserted between the air-chamber at that time already in place on the penstock and the penstock itself, which device has heretofore been referred to as "Defendant's Exhibit Cobb Pressure-regulating Device Circular." Referring to Defendant's Exhibit Blueprint Nozzle and Governor for North Star Mine, the parts

shown on this blueprint which are similar in construction to the parts supplied to the 1896 installation for governing the water-wheel were the governing mechanism shown at C, with its balanced valve F and levers E, connecting-rods I and K and rocker-arm J, and pipe connections also for connecting same to hydraulic cylinder D, and water-gate B. And they were not constructed, in so far as the lengths of certain rods are concerned nor as regards the position of those rods, as shown on this blueprint. But the rods I have named by letters had corresponding rods answering the same purpose in the installation. The blueprint now being referred to shows the construction of the governor and nozzles and hydraulic cylinder, etc., as applied to a small 5-foot diameter water-wheel which was installed at the same time as the 1898 installation, and refers specifically to that particular wheel installation of 1898.

Q. 268. Then this blueprint, namely, "Defendant's Exhibit Nozzle and Governor for North Star Mines, Grass Valley, California, September 3, 1898, sheet 27" is not a blueprint of the working drawings which were specifically prepared for the North Star installation of 1898?

A. Yes; they are.

Q. 269. This blueprint is from a tracing made for the plans of that particular plant and no other, is it?

A. This is the blueprint from which the work was actually constructed in the installation of the 5-foot wheel in 1898.

Q. 270. And where was that located?

A. In the same power house at the North Star Mine

with the other wheels that have been mentioned in connection with the North Star general lay-out.

Q. 271. And all those wheels have the same governing device?

A. In 1898 this same governing device was applied to two wheels that were being installed in 1898 as an addition to the installation that had been previously put in there about 1896, and I believe I can show it to be true that upon the order of the owners a similar governing device as had been designed for the two wheels installed in 1898 was ordered at the same time to be installed to control the wheel that had been previously put there in 1896.

Q. 272. Then the controlling means of the wheel as installed in 1896 were not found satisfactory?

A. I infer that. I do not remember definitely the construction of the governing mechanism put there in 1896. I have a very vague idea of it. It was not supplied through my office and I had nothing personally to do with that installation except that I had supplied the wheel itself which went on the compressor shaft, and I supervised the erection of that wheel, and the buckets of the wheel; and I believe, as far as I remember, the governing device was supplied by the Pelton Water Wheel Company and the air compressor that the wheel was to drive was supplied by Edward A. Rix. But the 1896 installation, my only interest and my only authority extended to the actual water-wheel itself, without any reference to any other details of the general plant.

Q. 273. Now, in this so-called 1898 North Star Mine

installation, there was no by-pass for the penstock or in the penstock, was there?

A. When the wheels put in in 1898 were ready to start, there was also in position in the penstock, to the very best of my memory, the device shown in "Defendant's Exhibit Cobb Pressure-regulating Device Circular," or the device there shown was installed within a day or two of the time that the wheels should start. The exact condition I am not able to say, because the machinery was erected in place as it arrived on the ground. I saw the device represented in Defendant's Exhibit "Cobb Pressure-regulating Device" installed there when we were operating, and the wheels being those that were installed in 1898.

Q. 274. That by-pass, as you call it, was not connected in any way with the governor of this installation of 1898?

A. In no way at all. The conditions were such that it was impossible to devise the proper pressure-regulating mechanism and attach it to the governor of the wheels, for the reasons previously testified to, that the pressure in the penstock at this power plant was caused to vary very heavily at times by the uses of water taken from the same penstock at a distance from this particular power plant.

Q. 275. How was the governor of this 1898 installation operated? That is to say, what was its operative connections to drive it?

A. It was belted from the water-wheel shaft which, incidentally, was also the shaft of the air compressor which was being driven by the water-wheel in two of

the cases, and in the case shown on the blueprint the governor was driven from a similar shaft, but it was the shaft of an electric generator.

Q. 276. Do you know how long this installation of 1898 was used after it was operated?

A. I do not.

Q. 277. Do you know what has become of it?

A. I do not. I never heard from them that it ever was changed or removed or in any way altered.

Q. 278. You don't know that it is in existence to-day, do you?

A. No, sir; I do not.

Q. 279. Now, as to this device that you have installed and which you refer to as being shown or illustrated by "Defendant's Exhibit Cobb Pressure-regulating Device Circular," you were the inventor of that device, were you not?

A. Yes, sir.

Q. 280. And you received a patent for it?

A. Yes, sir.

Q. 281. And the date of this patent was August 3, 1897, as printed below the cut, being part of this exhibit circular.

A. Yes, sir.

Q. 282. Do you know whether any such devices made in accordance with this patented invention are in use today?

A. I do not. I have not seen one of them myself since I moved from San Francisco in 1900.

Q. 283. When did you last design one or specify it

for installation in connection with any water-wheel plants?

A. I never did specify them unless I conferred first with the prospective owners with regard to whether it would do them any good. But the last one I installed I believe was at the Blue Lakes Water Company plant on the Mokelumne River, and it must have been prior to or during the early part of 1898. I believe I can establish that time more specifically by reference to notebooks that I think I have bearing on the subject.

Q. 284. As far as you know, there has been no such device constructed and installed for the last ten or twelve years, has there?

A. No, sir; when I left San Francisco I sold the patent and gave no further attention to it.

Q. 285. Do you know who owns the patent now?

A. No, sir. It will run out next summer, I think.

Q. 286. Whom did you sell it to?

A. The Joshua Hendy Machine Works.

Q. 287. You say there was another pressure-relief device in position on the penstock at the time you applied this device to the 1898 plant?

A. No, sir.

Q. 288. What was that other device that you have referred to?

A. An air-chamber.

Q. 289. And that acted how?

A. It acted to gradually reduce the liability of the frequent water-rams occurring in this penstock damaging the pipe as a whole or the penstock as a whole.

Q. 290. Then was I not correct in saying that there was another pressure-relief device in the penstock?

A. Well, not in the sense that I am thinking of pressure-relief. But it caused any change in pressure to take place slowly. That was the object of the air-chamber.

Q. 291. In other words, it eased up the pressure?

A. It acted as a cushion.

Q. 292. And its action was not sufficiently compensative for such pressures, was it?

A. It took care of the thing exactly and properly as a cushion. But the difficulty with an air-chamber used under such conditions as that was in use, I can briefly explain as follows: Suppose you have a penstock or pipe-line conveying water at a certain velocity, and that this penstock, being supplied with an air-chamber such as the penstock in question had upon it in 1896, and then assume, which is good practice, that that air-chamber were about two-thirds full of air compressed to the same pressure as the water in the penstock. Now, then, if any outside force acted to suddenly retard the flow of water in the penstock the energy in the moving water would compress the air in the air-chamber to a greater pressure than normal and would continue to so compress the air until the moving force were balanced by the pressure of the compressed air. The elasticity of this compressed air would then start a return flow of water in the penstock which would not of necessity be as great as the initial flow, because of the action of the friction, but such return flow would take place; and then a second action of the water to flow toward the air-chamber would take place, and these vibrations of flow would take place

until the whole original energy of the ram in the penstock would be dissolved by friction. All these actions, it will be understood, tended to keep the pressure in the penstock fluctuating. To prevent this action of the air-chamber just described, I introduced the check-valve shown; and when any air was compressed above the normal pressure in the air-chamber, until such time as the pressure were balanced, as heretofore described, for the first ram of water the check-valve would close of its own weight, it being balanced in pressure on both sides, and prevent the excess pressure of air in the air-chamber making any return flow in the penstock, thus obviating the troubles of the continual repetition in decreasing effect of the original ram in the penstock.

Q. 293. But, nevertheless, under these conditions ram was first produced in the penstock, was it not?

A. The cause of the ram always originated in the penstock.

Q. 294. And there was an increased pressure in the penstock producing such ram before any action of either the old device or the device like that illustrated in Defendant's Exhibit "Cobb Pressure Regulating-Device Circular" could act? Is that correct?

A. Correct.

Q. 295. Now, in the use of the by-pass connected up with the water-gate, and the governor mechanically, as in accordance with the disclosures of Complainant's Exhibit Lyndon Patent, the water ram is prevented by the proper action of the by-pass, is it not?

A. That is true, provided the water-gate so connect-

ed and referred to is the only one on the penstock under consideration. That is not the case in Grass Valley.

Q. 296. I am assuming that this inter-related water-gate and by-pass and governor affect the flow of water jointly with respect to the penstock pressure.

Mr. Westall: You are assuming also, are you not, that Lyndon discloses an operative device which will actually produce the results claimed?

Mr. Blakeslee: The previous question states fully the conditions.

A. That would be true if that were the only installation on the penstock leading to it.

Q. 297. Well, wherever you had such a gate and such a by-pass operating jointly to govern the pressure in the penstock, in so far as controlled by and predicated upon the action of such gate and by-pass, would be controlled to prevent water-ram? Is that not correct?

A. That is right, in so far as they might control alone.

Q. 298. To your knowledge is there any plant to-day in operation the construction and inter-relation of the features of which approximates those of the 1898 North Star installation?

A. I never in practice had occasion to improve the conditions of a plant under such conditions of operation as were required at the North Star installation. It was a peculiar and isolated example, so far as I know, of its operating condition, and in my practice I never found such a complicated problem in regulation. My experience, as far as it has gone in the business, goes to show that most power plants have their individual penstocks

for their sole use, and they are not interfered with by other power plants operating off of identically the same penstock, which was the case in the Grass Valley installation. Consequently, their installation throughout must be considered as being designed and adapted solely for the purpose of controlling the conditions as they prevailed at their installation.

Q. 299. Leaving out of question the device which you patented and one of which you installed in connection with this 1898 North Star plant, do you know of any plant today in operation at any place which follows substantially the construction and inter-relation of the features shown by "Defendant's Exhibit Nozzle and Governor for North Star Mines, Grass Valley, California, September 3, 1898, sheet 27", blueprint?

A. I think any plant that controls its nozzle by a hydraulic cylinder and speed governor is similar to the installation made in 1898 at Grass Valley. It can only vary in some minor details.

Q. 300. But I understand from your previous testimony that you have not kept informed as to the natures of water-wheel governor installations since the year 1900? Is that correct?

A. Since the year 1900 I have not designed and installed any water-wheel installations originating in my office, but I know it is a fact that water-wheels are governed by the use of hydraulic cylinders and speed governors operating nozzles, and in that respect they are similar in a general sense to the installation at Grass Valley, which was one of the original installations using those devices. The Grass Valley plant installed in 1898

and used with the 30-foot wheel installed at that time, I mentioned particularly because it was the first one installed at that time onto which the water was turned, was, so far as my knowledge goes, the first practical successful nozzle put into use and tested that was operated by a hydraulic cylinder. I am led to believe that these remarks are true by remarks made to me at the time that the installation was made, conveying that impression. There had been many attempts made up to that time to make a nozzle with a moveable cross-sectional area regulator, and they had been for the main part very difficult to handle and became inoperative. But the particular design shown on these drawings on this blueprint in evidence here did work successfully and was the subject of considerable interest among parties interested in that line of work. The peculiar design of the nozzle itself rendered it practical to operate it and move it by means of a hydraulic cylinder, and it was successful.

Q. 301. But at that time, as far as you know, that is, in 1898, returning devices for controllers on water-wheel governors did not embody such features as the Lombard governor, as exemplified by Complainant's Exhibit W, did they?

A. Oh, yes. The Bakersfield plant was installed at that time and it had the finest so-called returning mechanism that was ever constructed.

Q. 302. I am referring specifically to such features of returning devices as the Lombard device as exemplified by Exhibit W.

Mr. Westall: The question is objected to as very

vague, indefinite and confusing. There are a great many different features and parts to the Lombard governor, and unless the question is made specific the question cannot be intelligently answered. We object also to the begging of the question by calling the Exhibit a "returning device", the manifest intention being to read it upon the claims of the Lyndon patent. Whether it can be called a "returning device" within the meaning of the Lyndon patent is a question for the court.

Mr. Blakeslee: We do not understand that it is within counsel's province to whisper to the witness from time to time, and we register an objection against it.

Mr. Westall: There has been no more whispering to the witness with this witness than there was to the witness Henry during the time of his examination.

Mr. Blakeslee: We deny that and the record does not show any objection to any such alleged procedure. In response to the last statement of counsel, we refer the court to the answer to question 100, being put to the present witness, being on page 545 of the record, in which the witness in referring to Exhibit H states as follows: "At this time I cannot tell whether the letters BB refer to the main operating lever near the arm BB or to the post nearby standing on the rack GG previously mentioned, which operates through lever arms in connection with the dashpot previously mentioned, and shown behind the pulley DD, all of which constitute a returning mechanism." As the witness has referred to the portions of the alleged infringing structures as a returning mechanism, the above question is specifically and directly and unequivocally cross-examination, and

we note this at this time because there will be further questions along this line and we do not wish any false construction to be placed upon the trend of the present cross-examination.

A. At that time the returning devices in use, so far as my knowledge was concerned, consisted of the floating levers heretofore referred to in the Bakersfield installation, and shown in the Exhibits in connection therewith, and the floating lever E on Defendant's Exhibit "Nozzle and Governor for North Star Mine, Grass Valley, California, September 3, 1898, sheet 27". These floating levers referred to acted when the governor acted to bring a balanced line-to-line valve to central position, and that, as far as my knowledge of the Lombard governor goes, is the object of the device Complainant's Exhibit W here shown.

Q. 303. And I believe you have stated that you have never studied and analyzed the operation of the Lombard governor device such as is exemplified in Complainant's Exhibit W. Is that correct?

A. I never have had an opportunity to have a Lombard governor under my control for the purpose of experiment or adjustment to study its operation under certain conditions or operation under any specific conditions.

Q. 304. Referring again to Defendant's Exhibit "Cobb Pressure-regulating Device Circular," I note that therein the phenomena of "ram" are referred to at some length. I take it that at the time when this circular was published these conditions or inertia factors in penstocks were well recognized. Is that not correct?

A. They were certainly recognized in my own practice.

Q. 305. And was it not at that time considered that one of the essential objectionable factors to be dealt with in water-wheel governing, and a factor to be eliminated, if possible, was such ram or shock in the pipe-line?

A. It was a recognized fact and had been for some years that in order to obtain the best regulation of water-wheels it was deemed to be absolutely necessary that the greatest possible uniformity of pressure be maintained in the penstock, and it is my memory of the matter that many concerns interested in the installation of water-wheel power plants were working along these lines of so controlling water-wheels or so designing the elements of the power plants that the water in the penstock should be subject to the slightest possible variation of pressure. The Risdon Iron Works had constructed devices that maintained constant flow in the penstock when governing the speed of wheels for changes of load; the S. N. Knight Company I know were working on the same general scheme, and I believe had produced practical results; the Pelton Water Wheel Company were giving attention to the same subject; the Girard Water Wheel Company were working on the same subject; and I had done what I could on the same subject in connection with the Grass Valley installation at that time to make their particular installation, which, as I have previously testified, was a particularly exaggerated case, as near correct to an accepted standard as possible. It was also within my knowledge at that time—and by “that time” I mean along in the years from

'95 to '98—that foreign corporations were working to produce similar results.

Q. 306. As I understand you, Mr. Cobb, no part of the installation for the North Star plant at Grass Valley, of either 1896 or 1898, is at present in existence or operates, as far as you personally know.

A. Personally I have not been at the plant since the fall of 1898.

Q. 307. When did you last hear anything about any of the features of this installation?

A. Well, a year or two later I heard that certain spokes in one of the water-wheels had broken and the material was found to be defective, and that they replaced the spokes with larger steel. But I never have heard a word about any of the nozzles or governing devices or any other features than what I have mentioned, as being disturbed or not disturbed. I have not heard anything in any way whatever about it since I came to Los Angeles in 1900. If I have, it has escaped my mind. But I don't think I have heard anything at all since then.

Q. 308. And you have no record of any nature of anything which has transpired in connection with that plant since 1900?

A. Not at all.

Q. 309. Referring to Defendant's Exhibit "French Patent" and Defendant's Exhibit "Translation of French Patent," have you ever seen any installation embodying the construction and inter-relation of the features disclosed in these exhibits?

A. I have seen installations having parts of the exhibits disclosed, but never have seen an installation that

contained each and every part shown on the drawing accompanying the French patent.

Q. 310. To try to connect this correctly on the record, I will ask you if you have ever seen any installation which you would say was a fair embodiment of the complete mechanism disclosed in these exhibits, and I am not now referring to such details as a particular centering of a lever or a particular size of a port or particular amount of play of any part.

A. I never have seen any plant or installation employing the devices indicated in the French patent exactly as there shown, but I have seen plants having many of the operative elements shown here, such as the hydraulic cylinder with its operating valve, the floating lever u, the fly-ball speed governor shown at the left hand of the floating lever u, the piston v, of the hydraulic cylinder controlling the water-gates. I have seen installations having the by-pass c controlled by the hydraulic cylinder r through the motion of its piston v and proper connecting levers or linkages.

Q. 311. Have you ever seen any installation containing all of the essential parts of these exhibits?

A. Yes.

Q. 312. Did such installation include the levers u and w and j, connected as they are disclosed to be connected in these exhibits, with the rod of the piston s, lever j being likewise connected with rod p and the rod v being likewise connected with the rotating or oscillating part x?

A. I have seen water-gates operated in substantially the same manner.

Q. 313. By the use of these parts I have designated, connected as I have designated?

A. I have seen water-wheel gates operated by connection to the piston in the hydraulic cylinder r, the piston rod v of hydraulic cylinder r operating the by-pass valve. I have seen the floating lever uu whose motion at one end was controlled by the speed element in the governing mechanism and whose central point of connection controls the position of a valve controlling the supply for operating pressure to the hydraulic cylinder r, and which floating lever also had connection with the piston rod v of the hydraulic cylinder r.

Q. 314. I will again ask you if you have ever seen all of the parts I have mentioned in the last preceding question connected together as mentioned in that question in any one installation?

A. Never as exactly there constructed.

Q. 315. You have stated in testifying in relation to the "Defendant's Exhibit Swiss Patent" that there are some rather hazy features shown therein. Are you in a position to positively state the exact operation and sequence of operation of this device, and parts thereof?

Mr. Westall: Objected to as not correctly stating what the witness has previously testified to.

Mr. Blakeslee: The record speaks for itself.

A. I understand the operation of the mechanism shown in the Swiss Patent sufficiently to understand that the gates for the water-wheel operate in conjunction with the gate for the by-pass from the penstock. The only reason that I know of that I could not right off hand describe every particular motion in this device was the

lack of opportunity to study out exactly the motions that are indicated by some of the smaller figures, as at Figure 4 and Figure 5, which I no doubt could readily clarify by taking time to study same, which have to do with the motion of the piston k enclosed within the piston f. But the proportions of the drawing shown are such that for any long motion of the piston f there must be also some motion of the piston k. But the construction is such here that the piston f may move faster or farther than the piston k in either direction, which relative motion, as I stated in my previous testimony, was affected or constrained or perhaps augmented by the specific positions of the parts shown in Figures 3, 4 and 5, which conditions of motion are exceedingly hard to explain from a drawing alone, because of the relative positions of many of the parts which any one part moves. That is what was troubling me at the time that I testified here before in reference to this patent exhibited. The features shown in this patent are readily observable—that there is a gate to supply the supply of water to the water-wheel and that there is a gate to allow the escape of water at the by-pass, between the penstock and the water-wheel gate, both of which are operated by a hydraulic cylinder, which, in turn, is acted upon by a speed-governor.

Q. 316. What do you glean from Defendant's Exhibit Translation of Swiss Patent'' as to any of the features with which you have difficulty in definitely stating the operations?

A. As I have previously testified, it has been lack of time on my part to study closely the translation of the

Swiss patent. I had only opportunity before coming here last week to read it over twice, and I have not got it all memorized or at all memorized. And at this time I am testifying strictly from an inspection of the drawing before me.

Q. 317. I note that this translation refers to the part d as a "tongue." What do you consider the part d to be?

A. The part d is a gate for opening or closing the passage for water from the penstock to the water-wheel, and such design of gate hung or suspended from one end and rotating about an end fixed against motion in any other direction, as if it is called a tongue-valve. That is simply a technical name known in some localities quite commonly. In other localities it might be called a swinging-gate. But that is simply a name as it may occur to an individual acquainted in any particular locality. It moves like a tongue in your mouth.

Q. 318. What do you understand the translation to refer to by the term "servomotor" in the purported translation of Claim 1?

A. I recognize that, as I read it, as a governor, and the regulating valve he refers to for the servomotor is a valve within the case n. The servomotor is the governor m shown on the drawing, and the valve operated by the servomotor is within the case n.

Q. 319. This claim refers to a governor and also to a servomotor. How would you distinguish within the translation of this claim?

A. I now find that word "governor" in the fourth line of the third paragraph of the first claim, and I re-

gard the word "governor" as used there and also in the eighth line in the same paragraph as being identically the same piece of mechanism referred to in the sixth line of the second paragraph of Claim 1 by the word "servomotor." I regard it now as I did before in reading these claims that the translator may have learned between the translation of the first paragraph and that of the last paragraph a better word or a more commonly understood word in our ordinary English, for indicating the same piece of mechanism or describing the same piece of mechanism.

Q. 320. Then which part do you consider the translator means to be understood as the servomotor?

A. The governor m.

Q. 321. Have you ever heard this term "servomotor" used in the art of water-wheel governing?

A. Not previous to this case.

Q. 322. Would you take it then that the translator of this purported translation, "Defendant's Exhibit Translation of Swiss Patent," was familiar with the terminology used by English-speaking people in mechanical matters?

A. In answer to your question I should say that the translator recognized the fact that he was using English terms instead of American, and changed his language, as indicated by the change which he made after translating paragraph 2 of Claim 1 and before he had completed the translation of paragraph 3 of Claim 1, because of the fact that in paragraph 3 of Claim 1 he uses a word for indicating the same piece of mechanism that is commonly understood in America in mechanical matters.

Q. 323. And that word is what?

A. "Governor."

Q. 324. In paragraph 3?

A. Yes, sir. It occurs twice in paragraph 3, and in the proper sense.

Q. 325. Whereas in Claim 1 he uses both the term "governor" and "servomotor", and in that respect is confusing?

A. I don't see the word "governor" in paragraph 1 at all.

Q. 326. Claim 1.

A. Oh, yes. He does use the word "governor" in paragraph 1, and it would certainly appear to me to be an oversight that he used the word "servomotor" at all. Perhaps he did it to prevent repetition. I see that in that paragraph both words are used. But he means the same piece of mechanism by both words. There is no doubt about it. The translator, as I recognize him, was a foreign man and likely to make that error, from my observation.

Q. 327. In other words, this is the kind of a translation which you would expect of a man born and educated in Europe, rather than in this country or England?

A. I would expect a man foreign born to introduce foreign words with greater facility than an American born man would.

Q. 328. Then he fell into the error also, in paragraph 1, Claim 1, I take it, by speaking of something being operated by itself, did he not, when he spoke of the "governor" being operated by a "servomotor"?

A. My reading of that was this: that in his mind, as it is proper to consider it, the whole mechanism—you can readily understand it yourself—that the whole mechanism which he is pleased to term “governor” or “servomotor” m clear to the gate d is a governor in the broad sense. And one of the elements of that complete governor is what he terms the servomotor m. Also one of the elements of the complete governor is what we would term in this country a governor m. We would use the language ourselves in just the same way, and yet the whole mechanism included the hydraulic cylinder, the springs and pistons and all, and is taken, as a whole, as a governor.

Q. 329. Then the mechanism that he refers to in the same paragraph for automatic regulation must also be the governor and also be the servomotor, according to his translation?

A. In that first paragraph, in reading that, one would translate that word or, at least, I would translate that word “servomotor” to mean that part of the mechanism which transmitted the moving force, and in that first paragraph is the hydraulic cylinder. It is the element producing the moving force. In the same sense, when he gets down to line 6 in paragraph 2 where he says “the water through the regulating valve of the servomotor”, he refers to the same hydraulic cylinder containing the piston f and the regulating valve referred to is the valve within the case n. Now then, in line 4 of paragraph 3 of Claim 1 he says: “produced by the regulating valve as a result of speed increase of the governor m. And in the same paragraph at line 7, quot-

*governor.
case n*

ing from the claim, "a slowing down of the rotation of the governor", and he certainly refers to what we call the governor represented at m, and that makes the connection clear.

Q. 330. Then you think that governor just referred to in paragraph 3 of Claim 1 is the same governor referred to in paragraph 1 of Claim 1?

A. Yes; there is no doubt about it in my mind.

Q. 331. Then you would not wish to definitely follow this translation in authoritatively and finally stating the mode of operation and inter-relation of parts shown in the drawings of "Defendant's Exhibit Swiss Patent", would you?

A. If I were going to use this translation to assist me in constructing a mechanism as shown by the Swiss patent, I would use my common sense in relation to such construction in connection therewith.

Q. 332. In other words, the personal equation[†] would enter into your use of it?

A. My experience with translations has been such that I have usually found that it is difficult to translate from one language to another idiomatic expressions so that they sound right in the ordinary language of our own country.

Q. 333. And that, of course, depends, I suppose, more particularly upon the familiarity of the translator with the language of both countries?

A. I have had in my employ before now a Swiss educated gentleman of Polish parentage who has been practicing theoretical engineering in the state of California for thirty years, I presume, or at least twenty-five to my

knowledge, who maintains that the making of a mechanical literal translation is impossible; and when he has been called upon to make translation of foreign documents he reads them until he understands them perfectly and then writes them so that an American can understand them and submits it as a translation, and he does not attempt to translate them literally.

Q. 334. But where the original text to be translated accompanies a drawing, as in the present instance, and that drawing shows, for instance, a fly-ball governor, there would be no sense in attempting to tell an English-speaking person that it was anything but a fly-ball governor in order to follow any idiomatic language of the foreign author, would there?

A. I wouldn't think so. It looks like a fly-ball governor to any American all the time.

Q. 335. Have you to the present moment given any particular study to "Defendant's Exhibit Translation of French Patent"?

A. Not closely in relation to its specific use of words. I read it over two or three times, over a week ago.

Q. 336. That is, the translation?

A. Yes, sir.

Q. 337. Was your discussion of the construction and mode of operation of "Defendant's Exhibit French Patent" based upon your understanding of this "Defendant's Exhibit Translation of French Patent"?

A. No, sir; I read the operation of the French patent from the drawing when I was testifying before, and I read it as completely as one could when the parts in the drawing will not move according to the statements. By

that I mean we say what will take place when a certain piston moves. A drawing does not move, while in our statements the piston does move, and we have to make it as clear as we can under those circumstances.

Q. 338. Have you ever seen a water-wheel governor installation which has involved in its construction and inter-relation of parts all of the essential features disclosed by Defendant's Exhibit Swiss Patent in the same general inter-relation of the parts?

A. From my interpretation of your question, yes.

Q. 339. Without specifying details of parts, did such installation have the various parts arranged as shown in "Defendant's Exhibit Swiss Patent" and connected up in the same manner and operating as to sequences in the same relation?

A. Yes, sir.

Q. 340. Were all the features of Figure 4 of the Swiss patent in that translation?

A. No, sir; I was talking only about essentials and not about details. There are a great many details that were not in any installation that I ever saw.

Mr. Fletcher April 9th, 1914, P. M.

Q. 341. Referring again to "Defendant's Exhibit Nozzle and Governor for North Star Mines, Grass Valley, California, September 3, 1898, sheet 27", being the blueprint, will you state briefly, as far as you can recollect, what the governing means was in the 1896 installation at this point in lieu of what is shown in this blueprint?

A. As I remember the 1896 governing installation, it included a fly-ball governor operating by means of a

hydraulic cylinder, the motions of which were controlled by said fly-ball governor, which, in turn, operated to control the water discharged by the nozzle upon the water-wheel.

Q. 342. And the installation of the construction and inter-relation of features shown in this exhibit blueprint, including the leading features which you have designated in large red letters on this sheet, was put into this plant some time after, in the summer of 1898?

A. The installation was begun in the summer of 1898 of the machinery shown on the blueprint drawing referred to, and the installation was continued along through the fall of 1898.

Q. 343. And it was not completed until before the end of 1898?

A. Approximately the end or latter part of 1898.

Q. 344. Could you locate the final completion of this installation by any month at the latter end of 1898?

A. Well, I never have been at the plant since about the first of January, 1899, and the plant at that time was all assembled and parts of it had been in operation. The mechanism shown on this blueprint had been tested out and operated and the parts operating the 30-foot wheel had been operated and the plant was prior to January 1, I think, in a proper condition to have compressed air and otherwise operated for the purpose for which it was installed.

Q. 345. Then you would fix January, 1899, as about the time of the final completion of this plant?

A. I believe that to be true; yes, sir. I remember that one of the elements delaying the completion of that

plant was the arrival of the parts of the generator, and the 5-foot wheel shown on this blueprint was the last portion of the plant installed. The 30-foot wheel forming another section of the same installation was put in much earlier in the fall and was in operating condition some months earlier than the 5-foot wheel.

Q. 346. Referring now to the so-called Power Development Company plant which you have located as having been installed at the foot of Kern River Canyon some 15 miles from Bakersfield, California, it was your belief at the time you rendered the report made in August, 1896, being Defendant's Exhibit Cobb & Hesselmeier's report, August 8, 1896, that the general specifications therein advocated would be a satisfactory means of accomplishing the ends in view? Is that correct?

A. Advocated by whom?

Q. 347. Advocated, as follows the wording,—
"Girard proposition".

A. The Giard Water Wheel Company, I suppose you mean?

Q. 348. Yes, sir; the Girard Water Wheel Company. (The question is read. No. 346.)

A. No, sir; for this reason: there are three specifications described in that report, and I don't know which one the attorney refers to in his question.

Q. 349. You state as follows toward the end of your report: "We are of the opinion that the proposal which most nearly fulfills these requirements and many other desirable features of less importance is that presented by the Girard Water Wheel Company."

A. That is correct.

Q. 350. Were you satisfied that their proposal would produce the required results in a plant of this type?

A. Yes, sir; I was satisfied with the proposal made by the Girard Water Wheel Company as set forth in that report.

Q. 351. And did the construction which entered into that plant substantially follow the proposal of this company?

A. It did.

Q. 352. And was it your conclusion after inspecting this plant that the results came up to your expectations at the time you rendered this report?

A. At the time the plant was submitted to test all the results anticipated by the text of that report were fulfilled with the exception of the efficiency of the water-wheels themselves.

Q. 353. Now, what date would you fix as the date of completion of this installation of the Power Development Company?

A. It was some time—I think some months prior to the time it was tested and reported on, and I reported in August, 1897, as shown by the exhibit on file here, which is a copy of the report referred to.

Q. 354. The date of that report appears to be August 24, 1897.

A. I don't remember it without looking at the text of it myself, but I know it was in August, 1897.

Q. 355. And this report was rendered substantially, or, at least, approximately at the time of the completion and after a short period of running of this plant?

A. No, sir; it was not. We worked there testing that plant on many different occasions, and for a long time at one time. I think we stayed with that plant one time for thirty days. There was quite a bunch of men, because we had a new construction to deal with and conditions new to some of us, particularly with regard to the wheels, and we were endeavoring to determine all points in relation to it with the greatest care, and the generator people were interested in the uniformity of speed and the Girard Company were trying to demonstrate that their wheels gave a greater efficiency than the test seemed to demonstrate, and there was a good deal of backing and filling as to who was responsible for the apparent shortage of load, and we finally, after a long time and convincing tests, came to the conclusion there was no doubt whatever but what the real fault lay and was entirely in the efficiency of the water-wheels. It is possible, although I can't be at all certain of it, that closer dates could be discovered than I have mentioned for the time when that was ready for water to be turned there, but I don't think I have the data that was given.

Q. 356. Were all these tests and other steps taken before you rendered this report of August, 1897?

A. August 1897 is the report of the test, isn't it?

Q. 357. "Efficiency Report."

A. All the tests I had anything to do with were made before that time, of course.

Q. 358. Including this 30-day test?

A. I can't say there was a 30-day test, but there was a long time. All I had to do with the Bakersfield plant was prior to this report.

Q. 359. Can you state definitely when you obtained the photographs in evidence, being marked "Defendant's Exhibits ZZ and XX"?

A. Those two exhibits are reproductions of photographic illustrations which must have been taken—the photographs were taken prior to the final testing of the water-wheel.

Q. 360. And where are those original photographs?

A. You have one of them on file here that I have in mind, marked "Interior of Power Development Company Power House". That was taken prior to any test work on the installation.

Q. 361. I mean the originals of these exact reproductions, being Exhibits XX and ZZ?

A. Referring to Exhibits XX and ZZ, these particular exhibits were photographs taken from a publication issued on September 7, 1897, or in September, anyway, 1897.

Q. 362. You mean these are photographic reproductions of others?

A. Yes, sir; these particular exhibits are.

Q. 363. Who made those photographic reproductions?

A. Pierce & Company, Los Angeles.

Q. 364. Have you available the originals of those reproductions?

A. I don't own the original volumes that they were produced from. I borrowed them from other parties and had these photographs taken.

Mr. Blakeslee: In view of the testimony of the witness, we must renew our motion to have stricken from consid-

eration the testimony concerning these Exhibits XX and ZZ, and renew our objection to these photographic reproductions as not being the best evidence and no sufficient foundation laid for the introduction of secondary evidence, and, therefore, that they are incompetent, irrelevant and immaterial.

Mr. Westall: The exhibits referred to in the last objection of counsel were simply introduced in the same manner that a drawing or chart or other representation might have been introduced, made by the witness on the stand, to make more clear his testimony. Owing to the inadequacy of words always to express ideas, these photographs are introduced only to aid in a more full description by the witness of the devices which were in use at the time and place inquired about.

Mr. Blakeslee: Then counsel understands that these exhibits XX and ZZ are not relied upon in themselves as being evidence of the things purported to be represented therein, or of the dates or times at which any of such things were in existence, or of the dates or times at which the purported original photographs of such things which may have been in existence were taken, but merely as auxiliary to the testimony of this witness?

Mr. Westall: I think in general counsel is correct, their only object being to make more clear the oral presentation of the evidence.

Q. 365. By Mr. Blakeslee: Now, referring to "Defendant's Exhibit Interior of Power Development Company's Power House", can you state definitely when you obtained this photograph or came into its possession?

A. I came into possession of that photograph about the time it was taken and was ready for delivery, in the summer of 1898.

Q. 366. You did not see the photograph taken?

A. I testified the other day that I did not, but I really have changed my mind^d since, and I am inclined to think that I snapped the camera that took it.

Q. 367. And developed the picture?

A. No, sir; I had nothing to do with the developing or printing. My reason for making that statement is this: that I have been thinking of this many times since this testimony was started to be taken, and it seems to me that this same photograph, with all the individuals in it, with one exception, was taken, and that is where I sat down on the generator in place of Mr. McMurdo, as shown in the exhibit, and he went and snapped the camera taking me in the position. Mr. Berry in the other photograph is standing instead of sitting at the water-wheel, and in the other photograph Mr. Smalley, who is lying down in the photograph on the floor, is standing behind the penstock.

Q. 368. And when was the last time you were at this plant?

A. I have been at the plant since the final time that I was there in connection with the completion of the installation—the Girard installation. When the Girard installation was completed and the report of its efficiency made, then there was a long period of time when the matter stood quiet, I presume by the owners being in discussion as to what they should do, and I went off about other business. I was very busy in all parts of

the country there, and I was there at a later date after some Knight wheels had been introduced into the plant to take the place of the Girards on the water-wheel shafts within the casing shown on the photograph. The exact date of that I do not recall, but I can determine by reference to my records. And I was there at still another date which I do not immediately recall. After the plant had been in use for some years the company concluded to do away with the long flume they had, following the contour of the canyon, and they did conduct a tunnel directly through the mountain; and when they connected that tunnel which had been constructed through the mountain to the penstock of the water-wheels, I was there on a visit of several days. But at that time I did nothing with the water-wheels and don't remember what water-wheels were in use at that time.

Q. 369. Have you any idea of this last time?

A. I don't quite remember. It must have been in '99.

Q. 370. You have not been there since 1900?

A. I can look that up and see. I think maybe the time when I went there, when they connected the tunnel to the penstock, was since I came here. I think I went up from here and stayed two or three days to watch the work while the man who really had it under his charge went away. I guess that was in 1900. There was absolutely nothing to do with the water-wheel. It was simply a connection of the penstock with the tunnel, and I had previously designed for the outlet of that tunnel, automatic gates for — I had designed and installed there gates which would maintain the level of the water in the

penstock automatically, and also designed a gate that was put at the inlet end of the tunnel to be worked electrically from the power house to close off water from the entrance to the tunnel. Sometimes a ground squirrel would go across there and short-circuit the system, and it would close the gate and we would be without water.

Q. 371. I will ask now if you can give the approximate last time by date when you were at this plant?

A. I could not, as I sit here. I think I might be able to approximate it quite closely if I had an opportunity to refer to notebooks, but I am not sure of that until I look at the notebooks.

Q. 372. You are not in a position to state within six months or a year of that last time?

A. No, sir; I am not. I don't recall it. I think it was since I came to Los Angeles in 1900. But the errand I did at the last time I was there had no connection with the plant in any other way except at the connection between the tunnel and the pipe-line running down the side of the mountain. I remember that pretty well.

Q. 373. Would it be as late as 1902 that you were last there.

A. No, sir.

Q. 374. Would you say it would be as late as 1901?

A. I would not attempt to say without looking at my notebooks. I don't think it was as late as 1901.

Q. 375. I note in this report of August 24, 1897, that you state is was found expedient to substitute oil for water in the hydraulic cylinder. When was that change made?

A. We discovered that we were getting so much of this mica achist float in the water that it filled up and clogged up our pipes and water passages and cut the valve-seats very badly, and in that way it made the valves leak. And to overcome that we put in a little oil pump to pump oil into the receiver under pressure to operate the hydraulic cylinder.

Q. 376. That change was made about when?

A. While we were working prior to the test reported. All the work in that test was done before the test was reported.

Q. 377. I notice certain red ink changes made in this report, or alterations. Can you state when those were made?

A. At the time the report was written. I think the report has absolutely not been touched by anybody to my certain knowledge since it was filed away, when I moved from San Francisco in 1900, till it was brought here. Those changes were typographical errors, either by omissions or misspelling. I don't remember what they are, but there could be no object in changing the report in any way except as to errors in typewriting.

Q. 378. I note that this report states on page 5 "The discrepancy shown and the lack of faith of the Girard Co., in the form of buckets which they used in their wheels, led them to change that portion of the wheels which contained the buckets and replace them with those portions now in position." Were those buckets originally used on the improved type, or something that the Girard people were experimenting with in the first installation?

A. The whole Girard installation at that time was new in this country.

Q. 379. In other words, the installation was designed as a novel and original installation of this plant?

A. By that particular firm of Girard people that did that particular job. That was their first installation.

Q. 380. And they had never tested out, to your knowledge, this installation in a companion or equivalent installation previously?

A. Not at all.

Q. 381. If they had done so would it have come within your knowledge at that time?

A. I think so, because they were a new corporation just starting in business.

Q. 382. Is that Girard Company in business at the present time?

A. I think not. I think this installation is the only one that they ever constructed. They hadn't much capital and they got into some trouble among themselves a few years—I believe they did make some other smaller wheels, come to think of it, but no larger installations to my knowledge. They made some smaller wheels, and maybe a lot of them, but no large installations.

Q. 383. And were some of these small wheel installations made after this Bakersfield installation?

A. I think so.

Q. 384. And they did not follow the Bakersfield installation?

A. I can't vouch for that, because they were self-contained units.

Q. 385. As far as you know they did not contain any of the distinctive features of the Bakersfield plant?

A. I would not attempt to say. I have an impression that they built more wheels than the Bakersfield wheels and I might be dead wrong about that.

Q. 386. But as far as you know, they did not contain the distinctive features of the Bakersfield plant?

A. I don't know anything about it at all.

Q. 387. To quote again from this report of August 24, 1897: "The by-pass valves are not reliable and have so far given a great amount of trouble and should be replaced by a construction that will render it possible to operate them with certainty by the hydraulic cylinder provided in part for that purpose." Now, what have you to say as to the kind of trouble the by-pass valve presented?

A. It was a cylindrical valve with a parallelogram opening through it much like an ordinary plug-cock, except that it was a true cylinder instead of being a tapered cylinder, and it fitted its enclosing case very neatly, and this mica, sand, or mica Schist sediment that floated in the water would get in there and bind the valve so tight that it would refuse to move and would grip and bind, and the first time or two it did that we laid the trouble to something else because the parts all happened to be strong enough so that when the valve stood still the hydraulic cylinder would not work, and we didn't know that it was the valve holding tight, and at first we had difficulty in locating the trouble. But we found it was this mica sediment and we had the same trouble with the gates in the water-wheels. The whole mechanism fitted

together so mechanically close that the sand gave us trouble and we had to make the fits less exact, and free them, to make them operate so that the sand would not bind them.

Q. 388. This quotation is from page 18 of the report, and in order that the record may show how this report was originally presented as evidence on behalf of the defendant, I will ask the witness if he will again please give the numbers of the pages which were originally sealed up in presenting this report here, as the record shows.

A. I stated before, when I took this report out to show it to the attorney for the defendant, I ran it over, and my idea was that he wanted a description of the plant at Bakersfield, and I saw that description on those two first pages and enclosed them with a led pencil mark, without reading the report at all and without looking at the contents of the rest of it I closed them off and left the last page in the report which contained the signature, so that the attorney for the defendant would know that there was a signature to the first two pages thereof. And when I closed them off I did not believe there was anything in them that the attorney for the defendant wanted, except that description on the first two pages. That is why I happened to close them off, and I do not now know the contents of the report by reading it in recent years at all. Some of these quotations just made to me by the attorney sound as fresh to me as they do to him.

Q. 389. Then you closed off, or sealed up all the pages of the report except the two first and the last?

A. Yes, sir; and for the reason and in the manner that I have stated, without reading the report at all.

Q. 390. Now, what was done, to your knowledge, to remedy the trouble with these by-pass valves?

A. I remember, without any reference to that report, that the by-pass valve and the water-wheel gate were all loosened in their inclosures. They were brought there fitting too nicely to work with anything except the clearest kind of water. Whatever I stated in that report was absolutely true at the time it was written.

Q. 391. You state as a recommendation in the quoted matter that the by-pass valve should be replaced. Do you know whether such replacement took place?

A. No, but I remember now what that referred to. I thought a gridiron valve would make a much better by-pass valve, and not likely to stick and be held to its seat by the water pressure.

Q. 392. Do you know how long these by-pass valves which you recommended against or complained of in this report were used, after you rendered the report?

A. No, sir.

Q. 393. Do you know that the installation at this plant was modified by substituting Tuthill wheels for Girard wheels?

A. I have understood so, but I also had the impression that Knight put in wheels before Tuthill did. Knight put them in sometime, whether it was before or after Tuthill I don't know. Knight and Tuthill both put them in. The wheel makers of San Francisco and that neighborhood were all anxious to put in wheels in the belief that they could nearer approach the efficiency of wheels

which the Girard people had originally guaranteed, and make a better showing of efficiency than the Girard wheels actually did, and the management of the Power Company was inclined to give these people an opportunity to try their wheels, and how many of them they gave, I don't know. And I have notes in my own notebook concerning the Knight installation, and I don't think I have any notes of the Tuthill. I don't think I went there at all at the time the Tuthill installation was tried out.

Q. 394. But you do know the Girard wheels were thrown out—

A. They were thrown out for lack of efficiency. I know that.

Q. 395. Does it come within your knowledge that when the Tuthill and Knight wheels were put in there was no synchronous operation of the by-pass and the water-gate?

A. It does not. I had no knowledge of any details they changed when they went there.

Q. 396. Don't you take it that the trouble with the by-pass which you determined when in this plant, which by-pass was put in, as you say, with the Girard installation, resulted from the experimental nature of this plant?

A. I think the reason the Girard people fell down on their efficiency was due to the form and general design of the water passages and water-wheel gates after the penstock entered the enclosing case of the water-wheel.

Q. 397. What efficiency did you find the Girard installation gave in this plant approximately?

A. I will have to refer you to the report. I don't remember.

Q. 398. Can you state without reference to the report?

A. I think it was about 70%; I don't remember.

Q. 399. What do you consider is a good efficiency in present day practice, as far as you are informed?

A. I am not up to the present day practice. I won't say anything about present day practice. They claim all sorts of things in the circulars, but what they are doing I don't know.

Q. 400. If the efficiency of that plant had been 80% at that time would you have considered that high?

A. I would have considered their guaranty extraordinarily high in every respect if it was presented.

Q. 401. And if the Girard installation gave that efficiency at the time you made that test which you have referred to, would you consider that the wheels were efficient in operation?

A. I certainly would.

Q. 402. This report further states on page 18: "The oil pumps for keeping up the supply of oil in the surge tank are driven far too fast, they should be reduced in speed to not more than one-half that now maintained. The present high speed causes hammering in the pipes and is too great when the area of valve passages is considered." What explanation can you make for such miscalculation by the Girard people?

A. The original installation did not contemplate the use of oil at all for operating the plant, and it was no part of the original design to supply oil for the opera-

tion of the hydraulic cylinders. But after the plant had been erected and after we had water flowing down the flume and the penstock for some little time, it brought down so much mica schist and floating sand as to interfere, as I have heretofore stated, with the operation of the small valves, and all that sort of thing, and to obviate that we hurriedly purchased such little triplex pumps as we could find in the market and belted it to the water-wheel shaft in a hurried way, and the water-wheel shaft making 250 revolutions per minute, and it drove the pump too fast. But it was all put in in a hurried way so that the test work might go on without waiting for anything in particular, and when that report was made I felt it incumbent on me to mention that fact, so that the owners would not leave it there permanently. That was all there was to that.

Q. 403. I note that the report concludes substantially as follows: "Hence, we recommend that when the above mentioned defects of the by-pass valves and oil pumps be properly made good and reliable and when dynamometers have been so adjusted that they shall measure a maximum transmitted load of 750 H.P., that these water-wheel units be accepted with such deductions as may be mutually agreed upon as a fair allowance to the Power Development Company as compensation for the fact that these wheels do not show exactly the guaranteed efficiencies; or, that the Girard Water Wheel Company be required to replace these wheels with such others as will show the efficiencies required under the contract." Do you know what was done in the final adjusting of accounts between the Power Development

Company and the Girard Company?

A. Nothing whatever.

Q. 404. You mean you know nothing whatever about it?

A. No; I had nothing to do with that part of it whatever.

Q. 405. Did you ever testify for either party in any litigation over this account concerning this plant?

A. To tell you the truth, I don't believe I remember that there was ever any litigation. It don't come to my mind at all right now.

Q. 406. It was your conclusion, was it, as reflected by this final resume of the findings of your report, that the plant as a whole—

A. I remember now all about it.

Q. 407. —was not a proper compliance with the proposal of this Girard concern, and that the plant should not be paid for, at least without proper and material calculation of alterations and subtractions?

A. For the reasons stated in the report that the wheels did not fulfill their guaranty of efficiency, I made the recommendation therein set forth, and the reference therein set forth concerning the by-pass valve operation was a mechanical trouble, as I have explained heretofore. In other words, if I had been designing the wheel myself, instead of the Girard Company,—if I had been designing the installation, I would have had a gridiron by-pass valve instead of a cylindrical one. But I had nothing to do with that part of it, and, consequently, I could only make a talk. I couldn't execute anything. I think they would have escaped a lot of trouble that they

had with the operation of the valve, that is, the moving of it in its case. It was not the fact that it by-passed water that made us trouble, but it was difficult to move within its case. It was strictly a mechanical trouble.

Q. 408. And all these troubles which the report reflects you consider sufficient to warrant a substantial reduction in the consideration which should pass to the Girard concern for this installation? Is that correct?

A. I believe that is correct, because the actual output of power was very much less than they had promised, and still, as I remember it, the owners were anxious if they could to give the Girard people opportunity to make the plant so that they would not have to reject it entirely.

Q. 409. And when you last went to this plant, which, as you say, was not later than 1902, the Girard installation was not there, was it?

A. I don't believe the wheel was there at all. I believe the governor was.

Q. 410. Do you remember whether the by-pass features were there?

A. No; I don't remember.

Q. 411. Are you now able to recollect any piece of litigation which you had anything to do with concerning the settlement of this account between the Power Development Company and the Girard concern?

A. I remember being called up from Los Angeles, here. I can't remember the date of it, but, anyway, I remember testifying in regard to the material that had been originally supplied by the Girard people and was discarded. I don't remember well what the nature of

that litigation was. I remember more particularly the day I was giving my testimony on the stand in the court in San Francisco that there was some reason or other that made it very important for me to catch the afternoon Owl train, and the Judge hurried me along so that I could skip out and take the Owl train for Los Angeles. But I don't remember much about that testimony. It was some specific thing, as I remember it, about the materials that were originally supplied by the Girard Company, consisting of a lot of bronze work and castings that was afterwards taken over by someone else, or wanted an appraisal on by someone else. I don't remember what that suit was. I wasn't long there at the suit. I was called up to it and they took my testimony and I left immediately.

Q. 412. But, as you remember, that suit referred to the matters of this Bakersfield installation and the Girard part of it?

A. I don't know all that the suit covered. I know that I testified in regard to some certain part that was used in the Girard installation. That is all I know about it.

Q. 413. The Girard installation that you testified about?

A. Yes, sir; and I guess that is all I knew about it at that time.

Q. 414. And when the substitution of the Tuthill and Knight wheels was made you don't know to what extent alterations were made in the general governing system of this plant, do you?

A. Not at all.

Q. 415. You don't know whether the by-passes were taken out, altered, or allowed to remain?

A. No; I don't know anything about it.

Q. 416. Now, this Bakersfield installation had to handle water at a low head, did it not?

A. What was considered for California a low head. In the New England States it would have been an exceedingly high head. But for California it was comparatively a low head.

Q. 417. And, therefore, there were not the same inertia conditions in the pipe-line or penstock to be dealt with as are met with when the water is delivered with a high head; is that correct?

A. No.

Q. 418. Please tell me why it is not correct?

A. Because the inertia conditions have nothing to do with the head. They have to do with quantity and velocity.

Q. 419. Has not velocity something to do with the head?

A. That might depend on circumstances. You can have a thousand-foot head with a five-foot velocity.

Q. 420. And the length of pipe has something to do with it?

A. Only as affects the quantity.

Q. 421. What were the conditions with respect to the velocity in the penstock?

A. Well, at the time that I was working with water plants, we aimed to have about 5 feet of velocity per second, and that was not always true. But it would be around from 4 to 6 feet. Plants would often be put in

where they expected to put in two or three units and only put in one, and they would make a penstock right to cover two or three, and if you measured the velocity when only one was operating, it was a slow velocity. But it was considered at that time that a 5-foot velocity was ample, although they ran up in some cases to 6 or 7 feet. But that was a matter of judgment of the engineer to follow for himself.

Q. 422. Now, independent of this by-pass device that you have referred to in this Power Development Company plant, what else was provided to offset sudden pressure in the penstock?

A. There was an air-chamber provided to give elasticity to the whole penstock system.

Q. 423. For the same purpose as the air-chamber was provided in the Grass Valley and North Star plant?

A. Yes; and I expect many other plants. To relieve or soften the strain due to changes of flow in the penstock.

Q. 424. And due to changes of pressure in the penstock?

A. Either way.

Q. 425. And I suppose if pressures were not considered dangerous this relief device would not be provided?

A. I can tell you why that was done. There was nobody putting in pipe-lines of any thicker material than was required for normal conditions of operation, and in the Bakersfield case in particular, if the pipe-line had been broken anywhere it would have flooded the power house with the discharge from the break, the power

house being in a low location relative to the remainder of the penstock.

Q. 426. And this break might have taken place if the water-gate had been closed down too fast, might it not?

A. Yes; but that was arranged for by operating the hydraulic cylinder through which the water-passages were such that it could not close suddenly in the Bakersfield plant.

Q. 427. So this pressure-relief device or air-chamber was put on to protect the governing, was it?

A. No, sir; not at all. It had nothing to do with the governor. It was to protect the main penstock line.

Q. 428. Well, if the by-pass had operated with full efficiency wouldn't the main line have been protected?

A. That is true, but you see the penstock and the air-chamber and all that was designed prior to knowledge of what kind of wheels would be put into place. I mean the air-chamber for the penstock connection was all designed before it was determined what kind of a water wheel would be put into the power plant.

Q. 429. But this air-chamber was allowed to remain connected up with the penstock during the operation of the Girard wheels?

A. So far as I know they were always connected with the penstock.

Q. 430. Was this construction of the plant, or preparatory construction, including the air-chamber, entered into before you reported on the proposal of the Girard Company?

A. There had been a lot of work done in preparing

for this plant before the proposals for the water-wheels were submitted to the company for determination, but the water-wheels had been determined upon, I think, before the penstock was completed, but not before it was contracted for.

Q. 431. I now show you a photograph and ask you if you can identify what is shown therein.

A. Yes. There is the penstock coming down the mountain, and the air-chamber, and the penstock for the water-wheel. Here is the discharging tube and the discharge tubes of the water-wheel. But all this work was designed early, just the same. That is a true photograph of the plant sometime in the early stages of construction.

Q. 432. What plant?

A. Bakersfield. It was my practice to insist on air-chambers on all pipe-lines I had anything to do with. That was put on at my suggestion and designed by myself.

Q. 433. And was it put on at your suggestion and designed by you after you had submitted the report of August 8, 1896?

A. I think not. But it would have made no difference to me in any case. I would have had it on there whether I made a report for the Girard water-wheels or Pelton water-wheels or anybody else's. I would have insisted on the air-chamber just the same.

Q. 434. You would not have cared for the by-pass or anything else?

A. No, sir; I had the air-chamber put on every plant that I had anything to do with where I had any influence to get it on.

Q. 435. Then you don't think the by-pass itself would be sufficient protection without the air-chamber?

A. I don't think I paid any attention to that. My policy was to get an air-chamber onto that because I had it in every plant that I had to do with.

Q. 436. Was that because you were anxious to sell your patented air-chamber device, or because you felt it was necessary?

A. No; I never recommended my air-chamber device to a purchaser in my life.

Q. 437. Then you thought it was necessary to put such an air-chamber on?

A. I think it saves the pipe-line in any case from excessive strain. One feels as though he does all he can if he puts on a substantial air-chamber.

Q. 438. As I understood your previous testimony, you have not specified or recommended the use of any such air-chambers, or have any installed, or superintended the installation of any such air-chambers in pipe-lines since about the year 1900? Is that correct?

A. That is about right. That is as near as I can put it.

Q. 439. Can you identify the other photograph I have handed you?

A. Yes; that is the exterior view of the power plant of the Power Development Company taken from a direction about southwest.

Q. 440. The same power plant that you have referred to before at the foot of the Kern River Canyon, of the Power Development Company?

A. Oh, yes. That is it. This photograph was taken

before the tunnel was driven through the mountains. These photographs were all taken prior to the summer of—I think some of them might have been taken in 1896. I think that might have been taken in 1896 and this is 1897.

Q. 441. In other words, the year of your first report?

A. Yes, sir; sometime along there.

Q. 442. And possibly were taken after you rendered your first report?

A. This one certainly was taken after and this one was taken along early in the work. I think this one certainly was taken after they determined on the Girard wheel.

Q. 443. In other words, the one which shows the completed building, or substantially completed building, was taken after the one which shows some foundation work and skeleton construction?

A. That is right.

Mr. Blakeslee: The Complainant offers the photographs last referred to in evidence as part of the cross-examination of the present witness, and asks that the same be marked as "Complainant's Exhibit Exterior of Power Development Co. Plant" and "Complainant's Exhibit Power Development Co. Plant during construction".

(The said photographs are marked "Complainant's Exhibit Exterior of Power Development Co. Plant", and, "Complainant's Exhibit Power Development Co. Plant during construction", each together with the title of the court and cause and the date upon which the same was offered.

Q. 444. By Mr. Blakeslee: This air-chamber or air-tank shown in these two photographs had no connection whatsoever, did it, with any of the governing features of the finally completed Power Development Company plant?

A. No mechanical connection whatever.

Q. 445. And its operation was automatic?

A. Entirely.

Q. 446. Did it act to take of the ^{core} ram in the pipeline or penstock?

A. It was incidentally for the purpose of taking care of any ram that might occur in the penstock if by an accident floating material carried by water jammed into the nozzles of the water-wheels or water-wheel gates. No such accident occurred at any time while I was present at the plant, so I don't know whether it ever did work that way or not, but it was there for that purpose.

Q. 447. Did it operate when the by-pass valves failed to properly operate, as you have testified and as shown in your report of 1897?

A. I cannot say from my own observation, for the reason that at any times when the by-pass valve failed to operate there was no change in the water-wheel gate. So, consequently, it didn't make any particular difference to the flow in the penstock. The by-pass valves in the water-gates were connected mechanically and solidly together and were operated from the hydraulic cylinder, and if any obstruction prevented the operation of either of the water-gates or by-passes you couldn't move the other independently. Consequently, that had no effect to cause ram in the penstock.

Q. 448. Then if the by-pass failed to work the water-gate would not work either?

A. That is, the water-wheel gate would not work.

Q. 449. Then there was no independent action of the by-pass by which it could slowly, or at any rate, return to normal position after a governing action, synchronously with the gate?

A. The water-wheel gates were moved at any time that the by-pass moved, and vice-versa.

Q. 450. And when the by-pass had performed its service and the gate had come to its final position following governing action, the by-pass could not move further to any predetermined and established normal position, independently of the gate, could it?

A. It did not move at any time without corresponding movement in the water-wheel gates.

Q. 451. In your report of August 8, 1896, making recommendations as to the Girard proposal, on page 5, where you refer to a rotating balanced valve connected to the same hydraulic cylinder that operates the nozzles, you say: "And hence no water ram whatever or the attendant fluctuations of pressure". In spite of that recommendation you still adhered to the advisability of installing this air-chamber?

A. Why, surely I would; and I would do it again to-day, for the reason that the action of a governor or the by-pass valves or water-gates or any other parts of the mechanism has no protection from the semi-floating chunks of wood coming down from the mountains which might jam into the nozzle of the water-wheel gates and choke off the flow of water without any action whatever

of the mechanical devices, and cause ram in the pipes.

Q. 452. And yet, as far as you know, no air-chamber is in use in any plant today or has been since 1900?

A. The reason I don't know anything about it is because I have not been in the business since that time. I think anybody putting in a pipe-line where there is danger of particles coming down and stopping the water supply is running a great risk without an air-chamber.

Q. 453. In these photographs just offered, I consider the air-chamber device referred to is the cylindrical tank or standpipe or pipe or drum which is clearly distinguishable from anything else in the photograph. That is, it is outside of the power house in the exterior view, and close to one side of the power house.

A. The larger drums standing close to the power house in the photograph mentioned is the air-chamber referred to.

Q. 454. Can you remember any specific instance where the gate or gates of the water-wheel was or were clogged by any floating obstacles, such as a chunk of wood, brought down through the supply-pipe?

A. I have been told of cases where chunks of wood have come down through the supply-pipe and jammed into a nozzle, and I believe from my present memory that the installation of the first penstock east of Fresno was destroyed in just such a manner.

Q. 455. Did that occur under your own observation?

A. No, sir; not under my own observation.

Mr. Blakeslee: This being the case, we will ask that the last answer of the witness be stricken from the rec-

ord and withheld from consideration as being mere hearsay.

A. It is a matter of my own knowledge. The knowledge came to me from reliable sources that such action had occurred.

Mr. Westall: In view of the last remark of the witness, I suggest that the motion to strike out is not supported by the testimony.

Mr. Blakeslee: It is to be noted that not even the sources are disclosed, and it is manifestly purely hearsay, no matter how much the witness may believe it to be a fact.

Mr. Westall: It is noted that the question asks whether the witness knows of his own knowledge, and he has answered responsively that he does know of his own knowledge.

Q. 456. By Mr. Blakeslee: With respect to your report of August 24, 1897, on the Power Development Company, I note that there are no tables accompanying the report as bases of your conclusions. Can you tell why that is?

A. The tables accompanying the original reports were blue-prints of tracings, the actual tables themselves being in the form of tracing and I have not the tracings. I do not know if they are at all available, but on account of the fact that we had in another set of files in our office these tracings, these particular blueprints were not attached to the report that we retained in our office. The original report that went to the company was fully equipped with the blueprints.

Q. 457. I now show you Complainant's Exhibit Z

and I will ask you if you have ever examined the same before?

A. I have seen a similar drawing to this but not this particular one.

Q. 458. Are you acquainted with the disclosure of this exhibit?

A. I think I understand the operation of the mechanism disclosed here, or can soon do so.

Q. 459. Will you kindly give a brief statement of what is there displayed?

Mr. Westall: Before answering the question, the question is objected to as not proper cross-examination, no reference having been made on the direct to that exhibit.

Mr. Blakeslee: The attention of the court is called to the fact that as noted this morning the witness has referred in his direct examination to a returning device or mechanism, and that furthermore we laid the foundation for this, based upon that foundation, in questioning the witness as to Complainant's Exhibit W.

Mr. Westall: The objection is that it is not proper cross-examination; not that there is no proper foundation laid.

Mr. Blakeslee: We are stating that the foundation is laid in the direct examination of the witness.

A. The blueprint Exhibit Z shows a rotating fly-ball governor G-E driven by the band-pulley H-E and giving vertical motion to the valve-stem YG entering valve-chamber EE-H. The valve-chamber EE-H contains a balanced line-to-line valve for supplying liquid under pressure to the hydraulic cylinder WG or for allowing

liquor to escape therefrom. The stem of YG which may have vertical upward and downward motion from the revolving element G-E has attached thereto a pinion engaging with a rack which is marked UU-J. It is not clearly shown in the blueprint that this rack is sufficiently connected to the mechanism marked "returning dash-pot", but we believe that to be true. The portion marked "returning dashpot" has within it a piston connected by the piston-rod L-E to a rocker-arm which in turn, by a connecting rod K-E, is connected to a post, which post is rigidly attached to the piston-rod of the hydraulic cylinder WG. This piston-rod of the hydraulic cylinder also carries at its extremity a rack engaging with a toothed quadrant which is marked GG-H, and said quadrant is mounted on the shaft D-E.

Q. 460. Now, let us assume that the shaft D-E is operatively connected with a water-gate and that the pulley H-E is rotated in step or proper ratio with the water-wheel shaft, such water-wheel being provided with water by the gate controlled by the shaft D-E. Can you state generally what the control of the water-gate will be, due to this mechanism of this blueprint exhibit?

A. I think so. Assuming all the parts to be in the position shown on the blueprint, and that the water-wheel is in operation at normal speed under normal load, as indicated by the question, then if speed be suddenly increased the fly-balls at the governor G-E will fly out and the upper portion of the governor will be drawn downward. This will cause the valve-stem YG to move downward and will move downward the balanced line-to-line valve enclosed within its case EE-H. Assume

that liquid under pressure enters around the balance valve referred to, to the pipe Z-E. Then when said balance valve moves downward it will allow liquor under pressure to enter the hydraulic cylinder WG at its left hand end, and will allow any liquor that may have been in the right hand end of the hydraulic cylinder WG to escape above the top of the balance valve just mentioned. This will force the piston in the hydraulic cylinder WG to the right, as we look at the blueprint, and will thereby cause a partial rotation in the shaft D-E and will cause the piston-rod L-E of the portion marked "returning dashpot" to move to the left, carrying with it the rack UU-J and revolving the pinion UU-J engaged with said rack, and extending the spring shown below said pinion and rack UU-J in a direction to the left. That will cause the spindle YG of the balance valve to revolve in such direction that the surface nearer to the eye moves to the right, and by reason of the screw threads on the upper end of this stem will cause the stem by its revolution to rise within a properly arranged sleeve therefor which is attached to the upper end of the revolving mechanism of which the balls G-E are the controlling elements. It will be remembered that in the first instance we discussed an increase of speed which caused the balls G-E to fly outward, causing the top of this device to drop downward. The movement of the hydraulic cylinder is such that it drives the stem YG upward in opposition to the downward motion imparted by the centrifugal force of the balls G-E. This immediately brings or consequently brings the line-to-line balance valve heretofore referred to to a position shown in the

blueprint, approximately, and has changed the position of the piston in the hydraulic cylinder and the position of any parts actuated thereby through the quadrant and rack GG-H. Coincident with all these motions, and acting as they are acting, the tension brought into the spring below the rack and pinion UU-J is acting in such manner as to attempt to move the rack to the right, which it will do though the piston-rod L-E may stand still, with such rapidity as is provided for by the escape of the liquor surrounding the piston in the returning dashpot circling around from one side of said piston to the other through the adjustable valves shown but not lettered. This movement inaugurated by the tension of the spring will continue until the springs have returned to the position shown on the blueprint, at which time it will have revolved on the valve-stem YG in an opposite direction to the direction previously referred to, but slowly, and thus allowing time for the governing mechanism to assume its original normal position while the valve-stem YG is assuming its original position within the sleeve at the top of the revolving element of the governor, and all without changing such position assumed by the balanced line-to-line valve, bringing all the rotating parts of the governor and the rack and pinion UU-J and the balanced line-to-line valve back to their original position, although the position of the piston in the hydraulic cylinder WG and the rack and quadrant GG-H and the piston within the portion marked "returning dashpot" have assumed a different position from that assumed before any motion whatever took place.

Q. 460a. Now, assuming that the speed of the wheel

decreases. What can you state as to the operation?

A. If the speed of the wheel had decreased from normal the operation would have been to have moved the piston in the hydraulic cylinder WG to the left, causing the quadrant GG-H to give motion to its rack shaft D-E in an opposite direction to that previously described, and likewise it would give motion to all the parts previously described but in opposite directions of action.

Q. 461. Now, without comparing in detail this governing device construction of this blueprint with the governing device construction is shown in "Defendant's Exhibit ZZ" and "Defendant's Exhibit XX" and "Defendant's Exhibit Interior of Power Development Company's Power House", will you point out whether this governor device of this blueprint will accomplish the same or any different general governing effects than the governor device in said other exhibits, and, if so, what?

A. The governing device^{as} shown on the blueprint will govern for variations of speed only, with the same practical results as the device shown on the exhibits in question. But the device shown on the blueprint will not act as quickly to perform such governing functions as the device shown in the exhibits mentioned, namely, "ZZ", "XX" and "Interior of Power Development Company's Power House", because of the fact that the device shown in the exhibits will act as a speed-governing device instantly the load on the wheels has been changed, and without reference to the change of speed in the wheels. And it will also act instantly, due to a change of speed in the wheels without reference to a change of

load. But the device shown on the blueprint will only act due to a change of speed without reference to the load in the governing.

Q. 462. Are the differences which you referred to due to the provision in the Power Development Company's plant of the features shown in "Defendant's Exhibit MZ"?

A. They are.

Q. 463. That is a speed-sensitive device, is it not, which causes a shifting of positions of governor parts upon variation of speed of rotation of the annulus, in which the other parts are combined?

A. It fulfills a double function of being a speed-sensitive device and a load-sensitive device at the same time.

Q. 464. And variations in the positions of the parts of this device as exemplified in "Defendant's Exhibit MZ" are due to variations of relative speed of the load shaft and the power shaft, are they not?

A. Not entirely. The levels EE may occupy a different relative position within the wheel B without any change whatever in the speed, and due entirely to a difference in the load carried. And, vice versa, for a constant load being carried they can change positions due to a change of speed.

Q. 465. A change of load means a change of speed in the load shaft?

A. Not necessarily. The load might be so applied that it would double in quantity without affecting the speed, if it was applied slow enough, and that governor would move all the time to correspond with that change of load without any change of speed.

Q. 466. But if there is any relief movement between the load shaft and power shaft it is due to a change of the relative speed of rotation of these shafts? Is that not correct?

A. No, sir.

Q. 467. How can the shafts relatively move without the rate of their relative movement changing?

A. The relative motion between those two shafts due to their connection with those linkages is so slight as to be almost immeasurable at the circumference of the shaft. The downward movement of those long levers was only 4 inches for the whole system, and the relative motion was practically nothing in the shaft.

Q. 468. All changes of position of the parts in the device exemplified by Defendant' Exhibit MZ are due to stresses imparted by motion of other parts? Is that not correct?

A. Well, I can imagine that if the shaft of the water-wheel was held still and you endeavored to move the generator shaft, that you would move the lever EE in this device through a small distance previously testified to.

Q. 469. But there has got to be movement of some other part to produce movement of those levers?

A. They would not move of their own accord without motion being imparted to some other mechanism.

Q. 470. And their movement would be in ratio to the rate of movement imparted to them?

A. They would not move at all as they were constructed as shown there until the rate of revolution has

become sufficient to overcome an initial tension set in the springs or adjusted in the springs SS.

Q. 471. But if they move at all that movement will be in ratio to the rate of movement imparted to them? Is that not correct?

A. No; it is not correct, because they move for the change of load which does not depend on the rate of movement imparted to them. They will also move due to a change of rate of movement, but they will also move without that by a change of load.

Q. 472. But you have stated that some movement must be imparted to them to get them to move. Now, the rate of that movement determines the degree of movement of these levers, does it not?

A. No, sir; it don't determine it.

Q. 473. The movement of those other parts does not determine the movement of the levers?

A. No, sir; the other parts are moved by the levers. The centrifugal force in the levers changes their position, and when speed changes take place, the tension of the springs changes the position of the levers when load changes take place.

Q. 474. Then the levers are parts of the speed-sensitive device?

A. They are.

Q. 475. And the other parts do not move unless the levers move? That is, the other features of the controller?

A. With a constant load on the generator, or water-wheel, and running at a constant speed, the levers will occupy a certain position in which they will remain while

the load remains constant and the speed remains constant. For every change of load or speed the levers will take a new position. That is not true of the device shown on the blueprint Exhibit Z which only takes a new position for change of speed.

Q. 476. Well, you have admitted that the levers of this device are a speed-sensitive device.

A. That is one of their functions.

Q. 477. But, nevertheless, they are a speed-sensitive device. Now, the fly-balls of the blueprint under discussion are a speed-sensitive device. In other respects and with respect to the movements of the governor responsive to movements of the speed-sensitive device, would the Bakersfield governor device do anything effectively that the blueprint device would not do as regards speed changes?

A. Only in that it would do it quicker.

Q. 478. The Bakersfield governing device would do nothing in addition but would only execute a quicker movement of the gate?

A. It would become established in its new position quicker in acting slowly as a speed governor than the device shown on the blueprint.

Q. 479. Was there anything in the Bakersfield plant analogous to what you call the "returning device" in describing this blueprint?

A. No, sir; there was nothing similar to the construction shown on this blueprint but the floating lever N in Exhibit XX, operated to control the balanced line-to-line valve in exactly the same results as the device shown on Exhibit Z.

Q. 480. And no other kinds of results would be produced by the operations of the floating lever in the Power Development Company plant?

A. Yes, sir; they would change position and control the valve and bring the balanced valve into the proper location for any change in load, without reference to speed.

Q. 481. But in doing so would they cause the execution of any valve movements other than those caused by the governor device of the blueprint? I don't care whether it is responsive to load or responsive to speed.

A. I do not understand what valve movement you refer to. There are a good many valves about these plants.

Q. 482. I am referring to the movement of the valve controlled by the floating lever N.

A. Do you refer to the balanced line-to-line valve?

Q. 483. Exactly.

A. All right. Let us have the question again. (Question is read by the Examiner.) As I understand your question, they would not produce any different results from the motion of the balanced line-to-line valve.

Q. 484. Please now similarly compare the blueprint, Complainant's Exhibit Z, that is, its disclosures, with the blueprint "Defendant's Exhibit Nozzle and Governor for the North Star Mines, Grass Valley, California, September 3, 1898, sheet 27", not as to details of the governing mechanisms, but as to the operative effect thereof, and state whether the governing device of Defendant's blueprint would accomplish any different gov-

erning action than the governing device of Complainant's Exhibit, and, if so, please state what.

A. The governing device shown on "Defendant's Exhibit Nozzle and Governor for North Star Mine, Grass Valley, California, September 3, 1898, sheet 27", does not disclose any difference in final results due to speed-regulation than would be shown by Complainant's Exhibit Z, the mechanism in Complainant's Exhibit Z consisting of returning dashpot and disconnected parts, including pinion and rack UU-J, and accompanying springs and fingers operating the same, to produce the same effects in Defendant's Exhibit Z that the floating lever E performs in "Defendant's Exhibit Nozzle and Governor for North Star Mines, Grass Valley, California, September 3, 1898, sheet 27".

Q. 485. Then, with both of these last mentioned features before any designer of such a governor, it would be a matter of selection of either one, in your opinion, optional as to the production of these results mentioned?

A. Expressing my own personal opinion, I would pick out that one which has the least number of operating parts. But so far as the results produced by them, they are the same.

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Q. 486. Referring to the Power Development Company plant, as testified ^{to} by you, and to Defendant's Exhibit MZ as illustrative of the speed-sensitive features of the governor thereof, to which shaft was the annulus carrying the centrifugal levers EE fixed, if either?

A. The annulus B controlling the levers E was fixed rigidly to the generator shaft.

Q. 487. Then, as regards the rotation of this shaft, these levers were a speed-sensitive device controlling governor action, were they not?

A. The levers were speed-sensitive to make governor action, and they were also the means of conveying certain spring-tension which controlled the gates through changing load action. They perform that double function at all times regardless of any specific conditions when the wheels were running. That is to say, they were liable to change position for every change of load that occurred without any change of speed, and for every speed that occurred without any change of load, or for any relative combination of these two actions. That is a fact without any question.

Q. 488. But these levers E could not be moved, could they, without a change in the speed of the generator shaft or of the water-wheel shaft, or a change in the relative movements of said shafts? Is that correct?

A. Not quite. I will make that clear. Any change of speed or any change of load would cause a very slight difference in the position of the generator shaft with reference to the water-wheel shaft in the direction of rotation, so to speak. That is to say, if the levers EE moved the total motion possible for them to move, through the relative connections of the linkages and the double crank arm B, a very slight difference of position between the shafts of the generator and the water-wheel, which could amount to only the very smallest fraction

of a revolution, on account of the combined conditions and fixed motion of all the parts, would take place.

Q. 489. What would this total in inches of relative movement?

A. I can't tell you that except by working out the dimensions.

Q. 490. We won't come down to definite quantities, but I will try to ask it to produce an answer which will state the relative conditions. Now, what would you say as to the amount of this movement last testified about with relation to the outward or inward movement of the balls of the speed-sensitive fly-ball device such as that shown in Complainant's Exhibit Z which you have testified to yesterday afternoon?

A. There is no means for my testifying as to how far the balls in the governor-device and the Exhibit Z would move, and the man that made the device could not tell how far they would move without trying it under specific stated known numbers of revolutions, by reason of the fact that the springs to which are attached the centrifugal elements would have to be tested to know what centrifugal force would produce a known difference in their positions. It cannot be guessed at at all in an answer of this kind.

Q. 491. What would you say, judging from the disclosure of Complainant's Exhibit Z, and from your knowledge of the movements or probable movements of the centrifugal levers E of Defendant's Exhibit MZ, as to the probable amount of movement of each necessary to produce a definite governing action? That is, which of

the same would you say would involve the greater motion, if either.

A. The action of governing would be brought about quickest by the action of the levers EE in Exhibit MZ.

Q. 492. And I take it from the previous answer this morning that if any governing action was produced through a change in load, there would be some corresponding change in the rates of rotation, that is, compared with each other, of the water-wheel shaft and the generator shaft? Is that correct?

A. I will state about that. Assume these shafts to be about 7 inches in diameter, for the sake of comparison. If the machines were working along under normal pressure with practically a full load and the proper speed, and that the load were entirely thrown off suddenly. Then on the circumference of, for instance, the water-wheel shaft, the motion in reference to a similar point on the circumference of the generator shaft due to the maximum movement of the levers EE could not have been, in my judgment, more than an eighth of an inch, and the exact amount of motion relative to each other could, if I had time to lay it out here to a scale, be determined exactly.

Q. 493. But for any such conditions consequent upon variation of load, assuming the speed of one of such shafts to remain constant, there would be a change in their relative speeds, would there not?

A. I cannot conceive speed to change without making at least one or two revolutions in a given time, and there was no possibility whatever for the water-wheel shaft revolving there but the very smallest angle with refer-

ence to the generator shaft without moving the generator shaft, and this small angle, as I have just stated, being moved by an arc an eighth of an inch long on a circle of 7 inches in diameter.

Q. 494. But the purpose of breaking the shaft connection between the water-wheel and the generator was to enable the introduction of this governing device as per defendant's exhibit MZ, was it not?

A. Certainly.

Q. 495. And, consequently, to allow for the relative displacement of one shaft with respect to the other? Is that not correct?

A. Not to more than the amount I have previously stated.

Q. 496. But if there were no such relative displacement and if this were one continuous rigid shaft, the speed-sensitive device or dynamometer, exemplified in Defendant's Exhibit MZ, could not have been operative and would have been rendered a thing of no utility at this point? That is correct, is it not?

A. All those details of the device remaining exactly the same as shown in the drawing, it would not have been a governor.

Q. 497. Now, you have testified, Mr. Cobb, that there was a difficulty, as reflected in your second report on the Power Development project for the installation thereof, with respect to the by-pass valve. Do you not think that had there been installed in that plant a by-pass valve such as that 48 shown in the Lyndon patent, namely, a butterfly type of valve, the difficulties encountered would have been eliminated?

A. The difficulties encountered concerning the sand and floating grit in the water would have been eliminated, but the butterfly valve would not have acted correctly under the conditions, for the reasons that the conditions as designed for the movement of the gates and the by-pass valve in the Bakersfield installation was such that the area provided, for instance, for an increase of water supply to the water-wheel nozzle was identical with the area cut off from the discharge of the by-pass valve. A butterfly valve being substituted for the by-pass valve in question, would not thus act, for the reason that with uniform increases in the motion of the hydraulic cylinder, for instance, uniform areas would not have been affected in the discharge opening of the butterfly valve. And that same statement applies with equal force to the Lyndon patent. If the gates operated in the Lyndon patent shaft 21b are opened with uniform increments, the butterfly valve would not open with uniform increments, and, consequently, a butterfly valve could not be substituted in the Bakersfield installation without changes being made in the other connections or in its method of driving so as to correct this inequality of area due to the uniform hydraulic piston change of position. In my judgment the safest valve to use for the by-pass valve at Bakersfield plant, considering the water conditions, or that would have given the desirable increases and decreases in area, would have been a gridiron valve. That would have fitted in in place of the cylindrical valve without any difficulty.

Q. 498. Assuming that the proper operative connections had been installed between the governor and such

butterfly valve, the latter being substituted for the valve which was faulty in its operation, so as to get the proportional areas, would not such a butterfly valve have rendered better service than the valve installed and have been a good substitute for the same?

A. I would not admit of its giving better service. It would be simply a substitute for the cylindrical valve installed there.

Q. 499. Well, there would not have been the surface areas with such a valve to stick or jam as on the valve that was used?

A. It is presumed that a butterfly valve does not present such surfaces, but the seats provided in such valve against which the valves close in trying to cut the water entirely off, do become inactive to prevent the valve from closing, and all by reason of accumulated sand in conditions where sand prevails.

Q. 500. However, this would not affect the movement of the butterfly valve under control of the governor, and, particularly, in the opening action, I take it?

A. It may be assumed that it would not prevent its operation when the valve is not trying to be closed entirely off, for instance.

Q. 501. Or when the valve was being opened?

A. Well, if it had been closed a long time there might be sand enough accumulate behind it to prevent its being opened.

Q. 502. But I mean there would not be present the larger surfaces which would introduce such a great friction element opposing opening the valve?

A. There would not be so much friction opposing the opening of the valve.

Q. 503. Now, in testifying about the North Star installation in which the energy produced was used for operating an air compressor and as to which you have stated that fluctuations in load were not material in operating the compressors satisfactorily, I take it that fluctuations in the penstock, that is, varying pressures and velocities, would not be as material as under the conditions met with in plants where electrical generators are operated? Is that correct?

A. When they installed the electrical generator in Grass Valley in 1898 was when they gave more attention to uniform pressure in the penstock. The original installation at Grass Valley was the one that demonstrated by its action the ill effects of this extreme variation in pressure, and then the owners had a great deal of anxiety about the damage these frequent and many times excessive changes in pressure might do to their plant and their pipe-line. I might say for your edification that this pipe-line crossed to the power house on a concrete bridge, and the pipe was enclosed in concrete, and after it had been operated there for quite a time there came such a water-ram in the penstock that it split that concrete viaduct from end to end, and, as close as we could observe, the gauges which were registering the pressure, the hands of the gauges were going up above normal pressure in excess of 40 pounds, and then in the rebound from the elasticity of the pipe and air-chamber would throw it back to 25 pounds less than normal, and it would see-saw to such

an extent that you could hardly appreciate it. The normal was, I believe, about 375 pounds.

Q. 504. And the action of the air-chamber rather contributed to such fluctuations, did it not?

A. The action of the old air-chamber that was on there—the plain air-chamber—the air-chamber that was on there in the first installation, would always continue the vibration of the ram until the friction of the water vibrating back and forth in the pipe-line took up all the energy of the original ram. But the action of the air-chamber was to prevent the ram from producing a sudden blow within the pipe-line. It gave the blow, in any case, elasticity. Like an elastic block to receive the blow of a hammer.

Q. 505. That is, the air-chamber would, you might say, flatten out the curve on a chart showing such fluctuations? Is that not correct?

A. I don't know what kind of a chart is in your mind at all, but I mean this: If you have a pipe-line without an air-chamber and water is flowing through it and that water-flow is suddenly stopped, the whole body of the water in that pipe-line will hit a blow as effectively to burst the line as if the whole body of water were a solid mass of iron or a pile-driver head. Now then, if that pipe-line is provided with an air-chamber of proper size and having a proper quantity of air compressed in the upper portion thereof, and it has a suitable connection to the pipe-line, then identically the same water-ram, as heretofore referred to in the pipe-line becoming effective, would exert its energy in causing the flow of water into the air-chamber which, in turn, would compress the air

above the surface of the water above its normal pressure and continue to so compress it until the entire energy of the ram had been absorbed in compressing the air to a higher pressure. Instantly that this balance of pressure was produced between the water and the air, the air would begin to act on the water to force it backward again up the pipe-line, and the momentum attained during that time would carry the water a little too far and it would return a second time as ram with nothing like the energy of the first ram, and that would cause the vibration or surging in the pipe-line and air-chamber, causing changes of pressure above and below normal, above or previously referred to.

Q. 506. Now, this air-chamber at the North Star plant, prior to the installation of your patented air-chamber or relief device there, was the same air-chamber in kind and performance as was installed at the Power Development Company plant as shown in the photographs which you identified yesterday; is that not correct?

A. It is certainly correct. That is, for the 1896 installation at Grass Valley.

Q. 507. And that air-chamber on the Power Development Company plant was retained there during the operation of the plant, as testified to by you, was it not?

A. Yes, sir; the air-chamber at the Bakersfield plant was put on there as a protection to the penstock, because the flume bringing water to the penstock in the Bakersfield plant was nearly a mile, and I think over a mile and a half long, lying along the mountain side, and the flume was open on top, and in cases of winds and sometimes in cases of rains large brush and sticks and the like of that

were washed down into the flume and would work down into the penstock, or there was danger of its working down into the penstock, and there was great fear that some of them might work into the water-wheel gates and cause a sudden stoppage of a portion of water flowing through the gate.

Q. 508. Now, on that point, to your knowledge, was there ever any such clogging & obstruction of the water gate in the Power Development Company plant?

A. During the times that I was there we had no serious accident of that sort, although chips and wood did come down and lodge within the mechanism. What helped very materially in the Bakersfield plant was a great large receiver lying parallel with the power house and outside of it, on which this air-chamber was located, and the water in this receiver was comparatively quiet, and the reason for that being that the whole penstock and receiver construction was ample for the installation of three units of water-wheels, and at no time during the testing period that I have previously discussed was there more than one unit in use at the same time. The consequence was that there was a very slow velocity of flow through the penstock proper, and the connections to the water-wheel gate from the main penstock outside of the building, to the water-wheel gates, were taken from the side of the penstock, the consequence being that in this large receiver or penstock outside the power house very heavy material would slide along on the bottom of the receiver and light material would float toward the top of the receiver. That condition of quietude of water in that receiver was only incidental to the fact that one unit of

the plant was being used, whereas the size of the receiver and penstock was sufficient for a moderate flow of water with three units being used at full load.

Q. 509. In addition to this large air-chamber or receiver, there were a number of smaller safety devices or relief devices on the pipe-line of this Power Development Company plant, were there not?

A. There were what was called air-valves on it, and no other pressure-relief valves at any time that I was there.

Q. 510. What was the effect of those air valves?

A. The effect of them was absolutely nothing under normal conditions. But if by any accident the penstock had broken loose at its lower end, the object of these air valves was to allow air to enter the penstock above such point to take the place of any water flowing out of the penstock, to prevent collapse of the penstock.

Q. 511. In other words, it provided an interior relief in the line so that there would be a tendency to maintain constant pressure?

A. Not at all. In no way at all. It had absolutely nothing to do with the flow of water in the line except in case of accident.

Q. 512. Were there not some safety relief valves in this pipe-line?

A. Not in my time, that I have any memory of.

Q. 513. The country in which this Power Development Company plant was installed was not a wooded country at all, was it?

A. It was upon the mountain sides up the canyon. Not what you would call a wooded country, but there was

a whole lot of brush and small scrub timber, and there was an awful lot of such stuff that would come down the river and get into the flume for miles and miles above there. We were getting timber in that flume from 80 miles above there—from 40 to 80 miles above there.

Q. 514. Did you have any kind of a screen?

A. We did not have any kind of a screen. The conditions were such there that we had to take the water—skim it off. We did not have any screen. We had racks put in that would take care of the larger stuff, I think, but no screens that I remember.

Q. 515. Didn't you have slats or racks or a screen put in between the flume and the pipe, as shown at the place indicated, where the pipe begins in Complainant's Exhibit "Exterior of Power Development Company Plant"?

A. We had a barn door to prevent eddy action, I know,—to prevent vortex action—and I don't remember at this time the details of any screen that might have been there, but I believe there was a screen constructed of half-inch round iron bars spaced about 4 inches apart.

Q. 516. Then no timber could come down of a larger diameter than 4 inches?

A. We were not trying to provide for any timber larger in diameter than about an inch, because any timber anywhere in size from a quarter of an inch to an inch in thickness would clog our nozzles. We did not have to take care of any timbers larger than that because they couldn't get into the nozzles.

Q. 517. Wasn't the object of this screen, as usually the case, to give clear or strained water to the plant?

A. It did not strain it sufficiently to prevent the danger that I speak of. It only screened out larger pieces.

Q. 518. In other words, it was put in of a certain mesh or with interstices of a certain size such as were found proper for the screening operations necessary to protect the plant?

A. No, sir; the conditions were such there that I doubt—To tell you the truth about it, I don't remember the screen in detail, but I do remember why the air-chamber was put on the pipe-line.

Q. 519. Did you specify this screen at this point?

A. No, sir.

Q. 520. When you had some of the obstruction occurrences in the plant that you speak of, didn't you advocate the provision of a suitable screen to prevent such obstruction?

A. We never had any accident due to the nozzles being clogged with wood while I was present in the plant.

Q. 521. Then to your own knowledge there was never any such clogging?

A. There did not have to be any such accident happen to make the use of the air-chamber proper.

Q. 522. But please answer the question. To your knowledge there was not any such clogging, was there?

A. Never while I was at the plant.

Q. 523. And there were other uses for this air-chamber further than as an assistance in balancing pressures, should any of this clogging take place? Isn't that correct?

A. No.

Q. 524. That is the only reason the air-chamber was put there?

A. If anybody should shut the main gate leading to the water-wheels too suddenly, that would act just the same as clogging and would produce the same effect as clogging, and that was the reason it was there.

Q. 525. In other words, to cooperate with the water-gate—

A. I am only talking about the main water-gate, H, I think it is, on one of the exhibits. I am not talking about the gates that control the quantity of water supplied to the wheel.

Q. 526. —put in there to cooperate with the water-gate, although mechanically independent thereof? That is, there being no operative connection between them? Is that correct?

A. No, sir.

Q. 527. What is correct as to that?

A. There was danger of the gate F dropping from the stem of the piston E of the hydraulic cylinder E. There was danger of the valve F becoming disconnected from the piston of the hydraulic cylinder E and shutting off water from any unit. There was also danger through carelessness of this valve being operated too quickly and producing dangerous strains in the penstock, and that was one of the primary considerations for supplying the air-chamber on the pipe-line.

Q. 528. You are now referring to the main gate supplying the water-wheel at the plant?

A. Those are the only gates I have reference to in the testimony this morning.

Q. 529. Which is the gate which corresponds in function with the gate operated by the shaft 21b in the Lyndon patent device?

A. Not at all; no, sir. Not as I understand it. The shaft 21b in the Lyndon patent controls the water-wheel gates. That is what it says there. It says it controls the water-wheel gate. And the gate F in the Bakersfield plant does not control the water-wheel gate.

Q. 530. This gate, however, although not the water-gate directly controlled by the governor, was within the plant and for the control of the wheels, and the air-chamber was outside of it with respect to the wheel? Is that not correct?

A. The gate controlled by the hydraulic cylinder E was not for the control of the water-wheel.

Q. 531. It, however, controlled inside of the air-chamber with respect to the line position, the admission of water to the gate directly controlled by the governor? Is that correct?

A. It was simply the closing-off of the main supply of water to any particular unit. It had nothing to do with the governor controlling the speed or power given off by the water-wheels.

Q. 532. Please answer the question with respect to the positions designated.

A. In position, every gate in the power house was between the air-chamber and the water-wheel. Any air-chamber beyond the gates would have been of absolutely no use at all.

Q. 533. I believe you have stated from your observation or during your presence at this Power Development

Company plant, there was no obstruction of the governed water-wheel gate by any floating objects or loose objects carried into the plant along the penstock. Is that correct?

A. I don't remember anything in the nature of wooden blocks getting in there while I was there. Plenty of sand was always present.

Q. 534. Anything larger than sand?

A. Yes, sir; larger than sand, but not larger than a house.

Q. 535. Well, what were the outside dimensions of anything that got in there?

A. I didn't measure them; I couldn't tell you. But pieces of sticks and stuff got in there, and I had no idea that I would ever be asked to tell what size, and I can't tell you. It was a miscellaneous lot of stuff. I helped shovel it out of the end of the receiver lots of times myself, and I didn't measure any of it.

Q. 536. Did you encounter any obstructing objects or materials of this sort at this plant larger in dimensions than is usually encountered or was within your experience usually encountered at water-power generating plants?

A. It is impossible for me to say what might be encountered at water-power generating plants. That all depends in lots of cases upon simply the water in any one day, and it is impossible to give an intelligent and proper answer to such a question as that, from my point of view.

Q. 537. Were the conditions there abnormal with respect to these obstructing objects that came into the plant and pipe-line?

A. The conditions were peculiar from the fact that we took the water from the river at the lower end of a long canyon, and I mean by that, 80 or a hundred miles long, the water in which was subject to great fluctuations in regard to quantity flowing, due to storms in the mountains and due to washing effects of such storms on the mountain sides, and it was a turbulent and difficult water to handle for the greater number of months in the year. It brought all kinds of wash from the mountain sides with it—leaves, limbs, brush and logs, and all that sort of thing—and owing to the necessary arrangements that nature required us to make at the original installation of the intake to the flume, it was impossible to keep all that kind of material out.

Q. 538. Wouldn't it have been an obvious expedient, not only to you as an engineer, but to any practical man running that plant, to put in a suitable mesh screen at the junction of the flume and the penstock, had there been any such serious obstacles or any abnormal conditions with respect to the water-supply?

A. There was care taken to prevent anything that they thought was going to be dangerous getting into the plant. But I don't remember the details used for that purpose at this minute, although if I saw a drawing or photograph of them I might be able to testify right off whether such a device was actually there or not.

Q. 539. Then if care was taken to this end, can you say that the primary object of the installation of this air-receiver on the penstock was to prevent improper conditions due to the jamming of the plant by such obstructions in the flowing water? *yes*